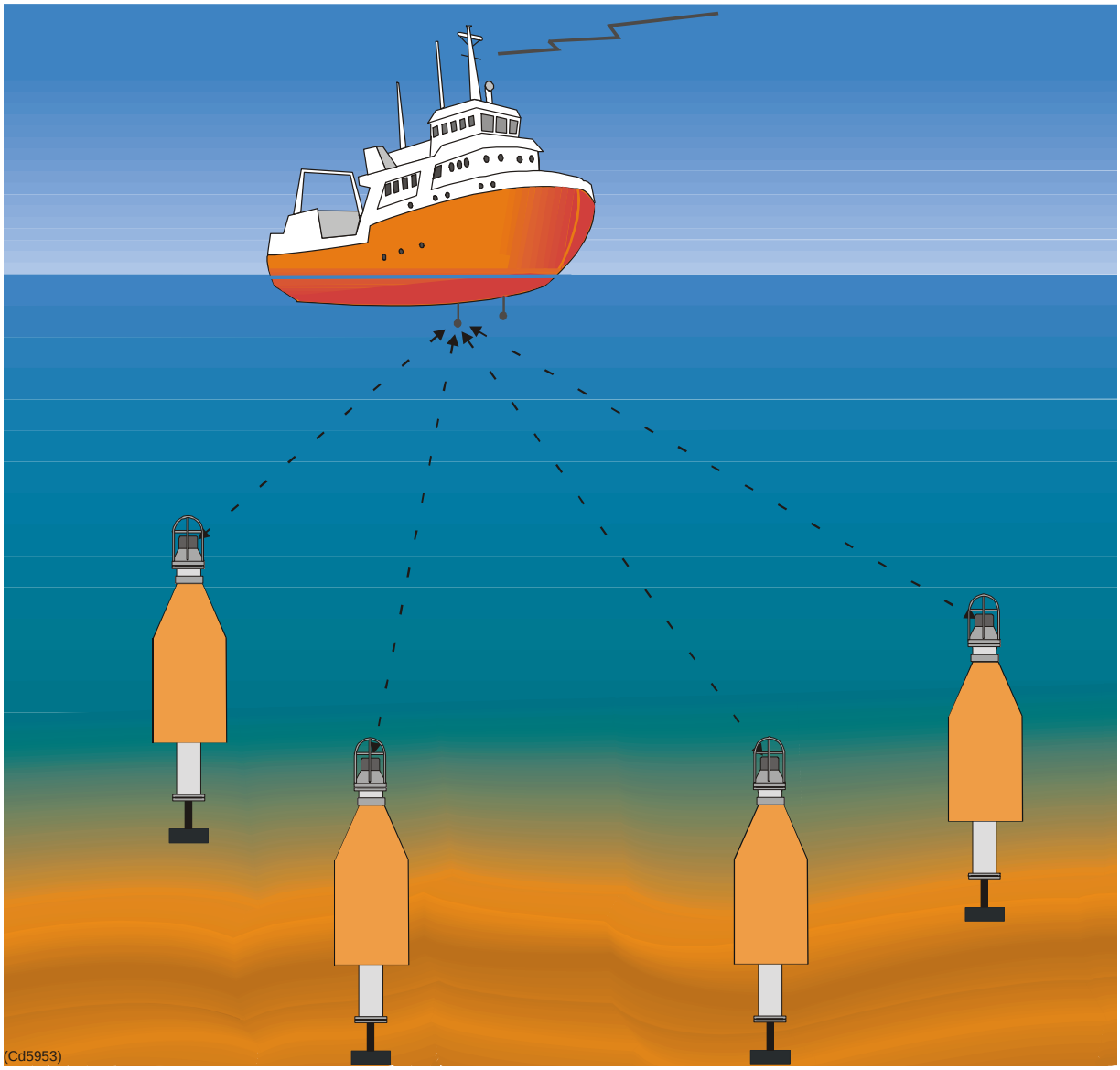
Instruction Manual

KONGSBERG

SPT and MPT 31x series

SSBL Positioning Transponder (SPT)
Multifunction Positioning Transponder (MPT)



857-160820

SPT and MPT 31x series

SSBL Positioning Transponder (SPT)

Multifunction Positioning Transponder (MPT)

This is the Instruction manual for the Kongsberg Maritime SSBL Positioning Transponder (SPT) and Multifunction Positioning Transponder (MPT) 31x series.

Warning ***Due to safety rules, the safety information for transponder and transponder battery must be read before handling transponders or separate transponder batteries. Refer to:***
- Safety information for transponder and transponder battery chapter on page 25.

Note

Kongsberg Maritime AS makes every effort to ensure that the information contained within this document is correct. However, our equipment is continuously being improved and updated, so we cannot assume liability for any errors which may occur.

Warning

The equipment to which this manual applies must only be used for the purpose for which it was designed. Improper use or maintenance may cause damage to the equipment or injury to personnel. The user must be familiar with the contents of the appropriate manuals before attempting to install, operate or maintain the equipment.

Kongsberg Maritime AS disclaims any responsibility for damage or injury caused by improper installation, use or maintenance of the equipment.

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Contents

Document logistics

Rev	Date	Written by	Checked by	Approved by
G	20.08.02	GM	SER	JEF
H	31.10.02	GM	SER	JEF
I	04.04.03	GM	SER	JEF
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(The original signatures are recorded in the company's logistic database)

G	Implemented the MPT 319/Si, MPT 313/S and MPT 313/RS transponders and the Alkaline battery. Minor corrections in the text. Refer to EM 857-160820G.
H	Added more detailed information about batteries. Upgraded frequency band information. Minor corrections in the text. Refer to EM 857-160820H.
I	Implemented new release. Updated drawings and channel and positioning frequencies information. Layout updated. Minor corrections in the text. Refer to EM 857-160820I.
J	Removed Warning Transponder containing a Lithium battery page, and the battery safety / transport and storage sections. Implemented Safety information for transponder and transponder battery (new chapter) and new DT sensor. Implemented new TP, the MPT 319/SiH, with modules. Minor corrections in the text. Refer to EM 857-160820J.
K	Implemented information about release-unit storage. Updated layout. Minor corrections in the text. Refer to EM 857-160820K.
L	Implemented new transponder the SPT 319/S and a new section; Drawing file. Updated Technical specifications. Minor corrections in the text. Refer to EM 857-160820L.

INTRODUCTION

Manual contents

This manual describes all the SPT and MPT transponders, for medium deep water use - 1000 m rated.

It provides technical specifications, safety procedures, operating instructions and maintenance procedures. It also includes spare parts lists and outline dimension drawings for each of the transponder units.

Warning ***Some of the transponders described in this manual are explosion-protected electronic units of the type "Flameproof enclosure"!***

→ *Refer to page 35 and 61.*

How to handle a transponder

Each of the transponders described in this manual contains a lithium battery (as a standard).

Warning ***Due to safety rules, the transponder must be handle with care. Refer to:***
- Safety information for transponder and transponder battery chapter on page 25.

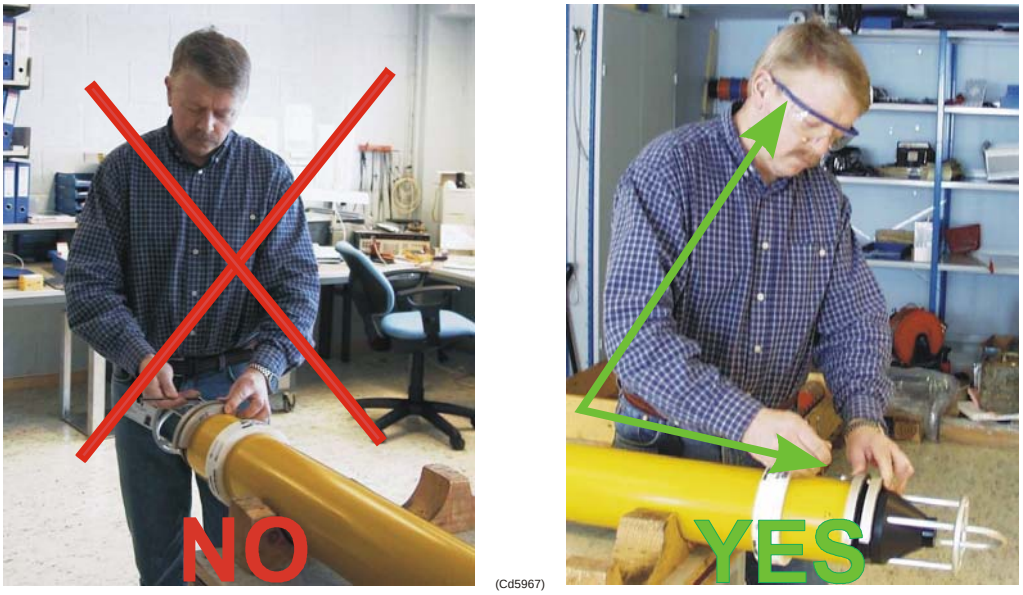


Figure 1 Special precautions to avoid personnel injury

List of abbreviations

BOP	Blow Out Preventer
HiPAP	High Precision Acoustic Positioning
HPR	Hydroacoustic Position Reference
LBL	Long Base Line
MF	Medium Frequency
MPT	Multifunction Positioning Transponder
N/A	Not Applicable
ROV	Remotely Operated Vehicle
SPT	SSBL Positioning Transponder
SSBL	Super-Short Base Line
TP	TransPonder
TD	TransDucer

General description

The SPT and MPT 31x transponder series are designed for use with the HPR and HiPAP systems. The following are available:

- SPT 314 transponder series
- SPT 319 transponder series
- MPT 313 transponder series
- MPT 316 transponder series (for use in EEX, zone 0)
- MPT 319 transponder series

→ *Examples of the transponders are shown in figure on page 4.*

All models described in this manual have an acoustic telemetry link for command and data transfer.

Most units are designed for ROV manipulator handling.

The transponder unit is designed with a modular construction such that the transducer, transponder electronics, battery pack and options (where applicable) can be replaced individually.

A transponder is normally a self-contained unit, its power being provided from an internal battery pack.

The transponder may be secured to a subsea structure using mounting brackets, or fitted with an anchor weight and buoyancy collar for location on the open seabed.

Transponder identification

An identification clamp ring is tightened around the transponder body. This ring is engraved with:

- Transponder name
- Transponder registration number
- Unique serial number
- Frequency channel
- Type of battery

The figure shows an identification clamp ring for a transponder that uses channel 57 and includes a lithium battery. Name and serial number is engraved on the other side - see illustrations in the *Spare parts* section.

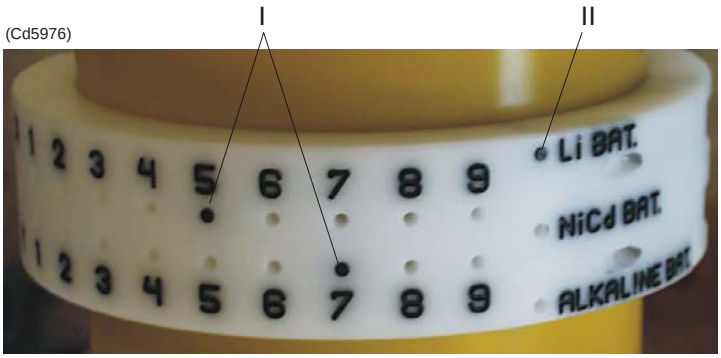


Figure 2 Example of identification clamp ring

If the TP configuration and battery is changed, the channel number (I) and the type of battery (II) can be altered by setting pegs into different holes in the clamp.

EEx transponder classification

The MPT 316 transponders are explosion protected electronic units of the types; EEx d IIB T6. The following units are available:

- MPT 316/DT EEx
- MPT 316/DT EEx 90

Caution *The units must be used as defined, and meet the requirements of EN 50 014 - 50 020 or VDE0171 Electronic apparatus for potentially explosive atmospheres respectively.*

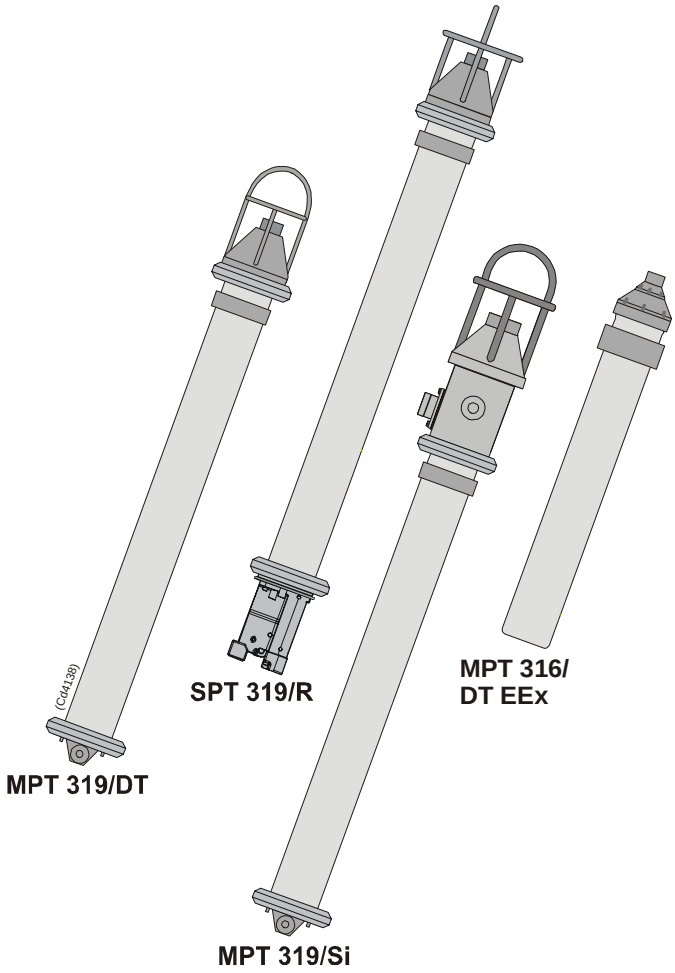


Figure 3 Examples of SPT and MPT transponders

Applications

On interrogation, all models will reply with either a single- or a multi-pulse response. The response information depends on the application. All SPT and MPT models can be used in the following applications:

- SSBL positioning
- Acoustic release
- Telemetry of sensor data
- Depth and temperature measurement

SPT specific applications

The following application can be used with the SPT only:

- Inclination measurement

MPT specific applications

The following applications can be used with the MPT only:

- LBL positioning
- Self positioning
- Range measuring

HPR and HiPAP compatibility

All the 31x transponders are compatible with the Kongsberg Maritime HPR 400 MF and HiPAP systems.

Available transponders

This manual covers the following transponders and special modules:

Transponder series	Model		Housing material
SPT 314			
	SPT 314	Basic unit	Aluminium
	SPT 314/R	Release	Aluminium
	SPT 314/I	Inclinometer	Aluminium
SPT 319			
	SPT 319	Basic unit	Aluminium
	SPT 319/R	Release	Aluminium
	SPT 319/H	Compass - magnetic	Aluminium
	SPT 319/S	Split transducer	Aluminium
	SPT 319/I	Inclinometer	Aluminium
	SPT 319/I-St	Inclinometer	Stainless steel
MPT 313			
	MPT 313	Basic unit (doughnut-shaped transducer)	Aluminium
	MPT 313/H	Compass - magnetic	Aluminium
	MPT 313/S	Split transducer	Aluminium
	MPT 313/RS	Release and Split transducer	Aluminium
MPT 319			
	MPT 319	Basic unit	Aluminium
	MPT 319/DT	Depth and Temperature	Aluminium
	MPT 319/R	Release	Aluminium
	MPT 319/DTR	Depth, Temperature and Release	Aluminium
	MPT 319/DT-St	Depth and Temperature	Stainless steel
	MPT 319/L-St	Basic unit with Long tube	Stainless steel
	MPT 319/Si	Serial interface for SSM 301	Aluminium
	MPT 319/SiH	Serial interface for Octans module, Compass - magnetic	Aluminium
MPT 316			
	MPT 316/DT EEx	Depth and Temperature with explosion-protected electronic unit	Stainless steel
	MPT 316/EEx 90	Basic unit with explosion-protected electronic unit and a 90 angle transducer	Stainless steel

Special modules

Module	Function	Housing material
Octans module	Fibre optic gyrocompass	Aluminium
Battery unit L24	Battery unit for powering the Octans module	Aluminium

Transponder model identification principles

The transponder name consists of:

- Model name (three letters)
- Model number (three digits)
- Any options included (letters after the digits)

→ *See example below.*

Model name

SPT = SSBL Positioning Transponder.

MPT = Multifunction Positioning Transponder.

Model number

The three digits:

Digit 1: frequency band

Digit 2: depth rating

Digit 3: beamwidth

The following are available:

1st digit	2nd digit	3rd digit
Frequency band	**Depth rating**	**Transducer beamwidth**
3 = 30 kHz	1 = 1000 m	3 = + - 30° 4 = + - 45° 6 = + - 60° 9 = + - 90°

Options

The combination of letters after the number describes the options contained in the unit. The following options are available:

DT	Depth and Temperature sensors.
R	Release mechanism.
I	Inclinometer (one unit).
L	Long tube - indicates that the unit is longer than standard, to accommodate a larger battery.
H	Heading magnetic compass.

Si	Serial interface.
S	Split transducer.
EEx	The unit meet the requirements of EN 50 014 -50 020 or VDE0171 *"Electrical apparatus for potentially explosive atmosphere"* respectively.
EEx 90	As described above, and the transducer is mounted at an angle of 90° perpendicular to the longitudinal axes of the transponder.

Housing material

Aluminium is standard housing material. If Stainless steel is used, the abbreviation "St" is added to the transponder name (see example below).

Example: **MPT 319/DT-St**

The example given (MPT 319/DT-St) therefore indicates that the transponder unit is an Multifunction Positioning Transponder, operating in the 30 kHz band, rated to 1000 meters depth, with a ± 90° beam width, and including the Depth and Temperature sensors. The housing material is stainless steel.

Transponder models description

Basic models

SPT 314

The SPT 314 can only operate as an SSBL transponder to provide positional information. It is equipped with a ±45° beamwidth transducer. All SPT 314 models are based on this basic model.

SPT 319

The SPT 319 can only operate as an SSBL transponder to provide positional information. It is equipped with a ±90° beamwidth transducer. All SPT 319 models are based on this basic model.

MPT 313

The MPT 313 transponder operates as either an SSBL or LBL transponder. It is equipped with a ±30 ° beamwidth transducer. The transducer is "doughnut-shaped", and provides a horizontal beam. All MPT 313 models are based on this basic model.

MPT 319

The MPT 319 transponder operates as either an SSBL or LBL transponder to provide positional information. It is equipped with a ±90 ° beamwidth transducer. All MPT 319 models are based on this basic model.

MPT 316

The MPT 319 transponder operates as either an SSBL or LBL transponder to provide positional information. It is equipped with a ±60 ° beamwidth transducer. The unit is explosion-protected, and it is equipped with a stainless steel housing. All MPT 316 models are based on this basic model.

Versions

/DT

The **Depth and Temperature** (DT) transponder is equipped with pressure and temperature sensors to measure:

- The depth at the position where the unit is moored.
- The temperature in the surrounding water.

Note

In the HPR 300 system only depth is obtainable.

/R

The **Release mechanism** (R) transponder is a recoverable unit fitted with an automatic release mechanism and buoyancy. This detaches the mooring sinker on request from the HPR / HiPAP system. Once the transponder has been released, it will float to the surface where it can be recovered.

You can reset the release-mechanism at the surface, and you can use the same unit many times in different areas. The mooring sinker will be lost during the release-operation, so it will require replacement every time.

/H

The **Compass**, (H) transponder is equipped with a heading magnetic compass. This unit also has an inclinometer that can be read by telemetry. When used for positioning, only the compass values are achievable.

/I

The **Inclinometer** (I) transponder is equipped with one set of inclinometers set at 90 degrees to each other. It is used to measure and monitoring the angles of structures such as:

- Rise angle measurement on oil platforms.
- Monitoring underwater pipelines.
- Template levelling.

/L

The **Long tube**, (L) is a basic transponder equipped with a long housing of stainless steel, to incorporate a large battery.

/S

The Split housing and transducer transponder (S). The unit has separate housing (electronics unit) and transducer. The transducer has a 15 m long cable, to connect it to the housing.

/Si

The MPT 319/Si is designed to interface the Subsea Sensor Module SSM 301.

/SiH

The MPT 319/SiH is designed to interface the Octans module (fibre-optic gyro compass). The MPT 319/SiH is also equipped with a heading magnetic compass.

→ *Refer to the /**H** version.*

/EEx

The **Explosive-protected** (EEx) transponder. The unit is explosion-protected, and it is equipped with a stainless steel housing. It is classified as *EEx d IIB T6*.

This is a completely encapsulated unit, and is not prepared for ROV installation or retrieval, as it has no protection-cage.

The depth sensor (pressure) is at maximum scale at 500 m, but the transponder can be deployed down to 1000 m.

/EEx 90

The Explosive-protected with a 90 angle transducer (EEx90) transponder, is an explosion-protected unit, and the transducer is mounted at an angle of 90 perpendicular on the longitudinal axes of the transponder. This transponder is to be used in an horizontal position. It is equipped with a stainless steel housing. This transponder is equipped with a locking-pin at the top (see figure in the spare parts section), which is used to secure the transponder in position when deployed.

Special transponder systems

Fibre optic gyrocompass transponder

The MPT 319/SiH together with the Octans module and the Battery unit L24, are a high performance true-north seeking gyrocompass that takes ***no influence from magnetic fields***.

The transponder and the Octans module are connected by a serial line (RS-232) in a subsea cable, with Gisma connectors. The Octans module is powered by one or two purpose-built Battery units L24. The Battery units L24 and the Octans module are connected by subsea cables with Gisma connectors.

- **Octans fibre optic gyrocompass,** true-north seeking gyrocompass
- **Magnetic compass**, for backup.

Note

When this transponder is used for positioning, only the compass values are achievable. Roll and pitch can be read by telemetry.

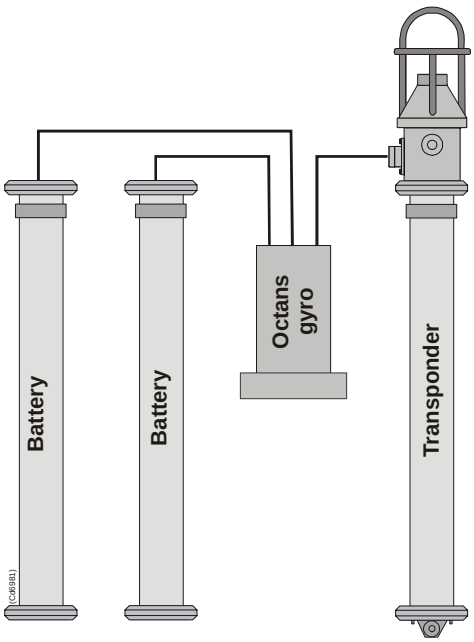


Figure 4 MPT 319/SiH transponder with batteries and gyrocompass

The four units can be assembled on an extension-shaft with candelabrum.

→ *Refer to page 90*

Battery pack L24 lifetime

→ *Refer to page 51.*

Orientation

→ *Refer to pages 39.*

Operation

→ *Refer to the APOS on-line help.*

Instrumented transponder system

The instrument transponder system, is a system where the SSM 301 and the MPT 319/Si transponder together with a HiPAP / HPR system, make a complete system for subsea monitoring of movements and positioning of subsea structures.

Figure 5 MPT 319/Si transponder and SSM 301

The transponder and the SSM 301 are connected by a serial line (RS-232) in a subsea cable with Gisma connectors.

→ *Refer to separate description of the SSM 301.*

Beam patterns

The figure below shows beam pattern for the following transducer types; ± 90°, ± 60° and ± 45°.
The beam pattern shows the transmit/receive sensitivity in the different directions.

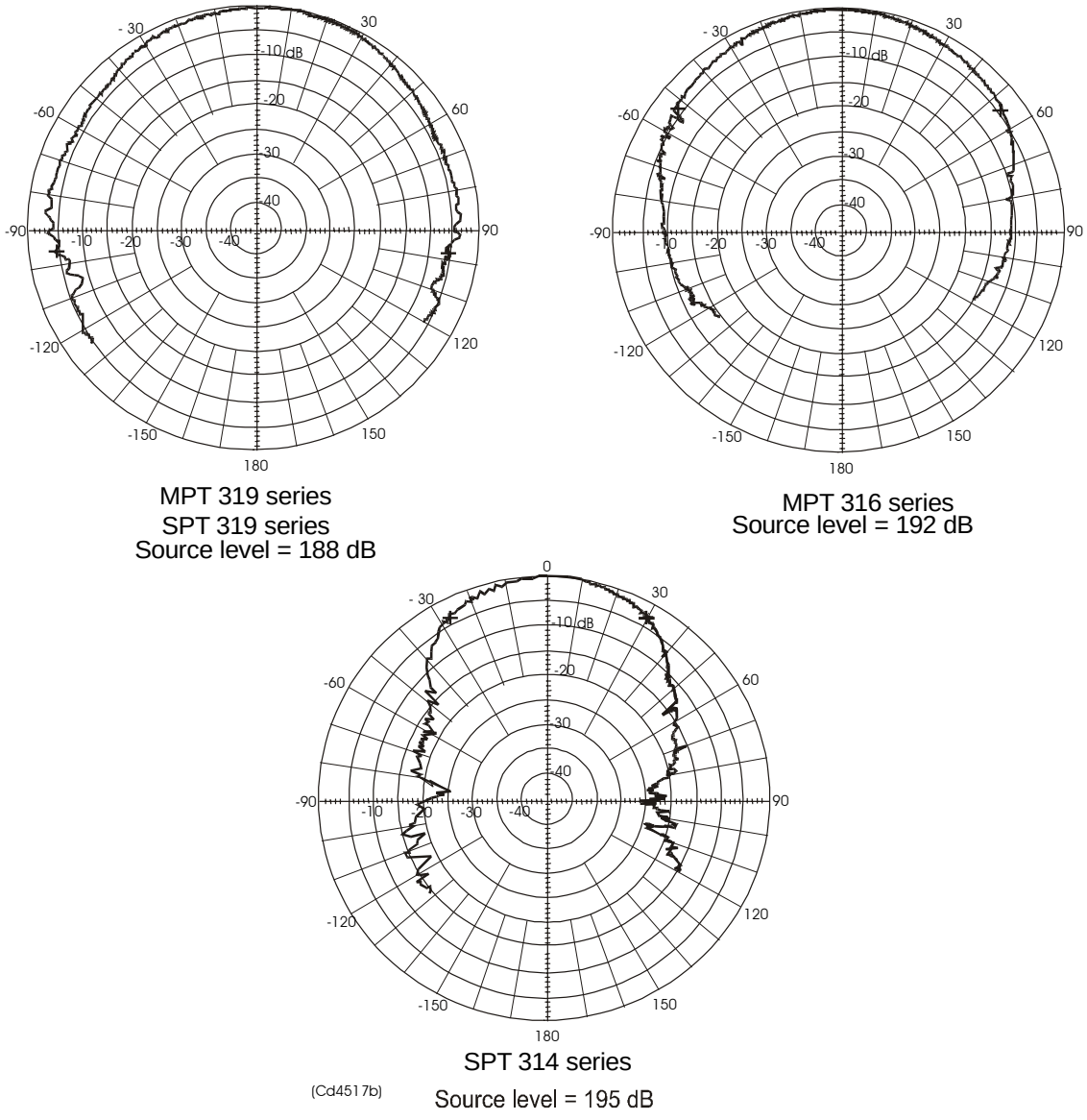
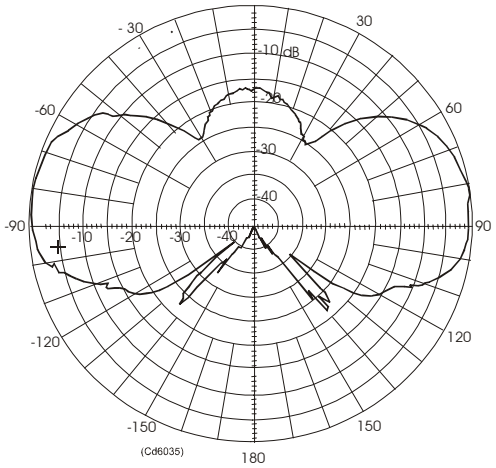


Figure 6 Examples of beam patterns

The figure below shows the beam pattern for the MPT 313 transducer. The beam pattern shows the transmit/receive sensitivity in the different directions.



MPT 313 series
Source level = 194 dB (Horizontal)

Figure 7 Examples of beam patterns

Auxiliary equipment

Various types of auxiliary equipment are used to mount a transponder in a correct and secure way. The most common types are:

- Floating collar
- Anchor-weight
- Mounting brackets
- Mounting collars
- Extension shaft with candelabrum

→ *For auxiliary equipment supplied by Kongsberg Maritime, refer to page 84.*

TECHNICAL SPECIFICATIONS

Source level and receiver sensitivity

The technical details given in this paragraph are common for all the transponder types (both Aluminium and Stainless steel) described in this manual.

Model series	Source level - max (4 steps of 3 dB)	Receiver sensitivity HIGH / LOW (2 steps)
SPT 319	188	100 /106
MPT 319	188	100 / 106
MPT 316	192	100 / 106
MPT 313	Horizontal: 194	100 / 106
SPT 314	195	100 / 106

Common transponder specifications

The technical details given in this paragraph are common for all the transponder types described in this manual.

Technical details	Aluminium models	Stainless steel models
Maximum depth rating	1000 meters	1000 meters
Housing material	Aluminium	Stainless steel
Flange and transducer head	Aluminium/anodized	Stainless steel
Finish	Polyurethane	
Operation temperature	0° to +30°C	0° to +30°C

→ *Outline dimension and weight, refer to page 144.*

Release units

As in common specifications, except:

Technical details	Aluminium models
Weight in air/water	2 kg / 0.5 kg
Length	221 mm
Max diameter	138 mm

Sensors

Pressure and temperature sensor

Max depth on /DT - sensors	1000 m
- Resolution	0.1 m
- Accuracy (FS)	< 0.1%
Temperature range on /DT - sensors	- 5° to + 30° C
Resolution	0.1° C
Accuracy	0.2° C

Compass sensor (magnetic)

- **Heading**

→ *Refer to the calibration on page 71.*

Note *This specification may be obtained after calibration, but only if all the magnetic anomalies have been cancelled out by the calibration.*

Accuracy level	± 1.0°	RMS
Resolution		0.1°
Repeatability		± 0.1°

- **Tilt**

Note *Can be read by use of telemetry.*

Tilt	± 20°
Accuracy	± 0.2°
Resolution	± 0.1°
Repeatability	± 0.2°

Inclinometer sensor

- **Maximum detectable angles**

HPR 300 channels	± 15 deg
HPR 400 channels	± 60 deg

- **Resolution**

HPR 300 channels - pulse position telemetry	0.25 deg
HPR 400 channels - pulse position telemetry	0.1 deg
HPR 400 channels - full telemetry	0.02 deg
Accuracy, standard sensors	0.25 deg

Aluminium transponders

Version /R and /DTR

As in common specifications, except:

Release; lift / buoyancy	225 kg

→ *Outline dimension and weight, refer to page 144.*

→ *Depth and temperature sensor, refer to page 18.*

Version /H

As in common specifications.

→ *Outline dimension and weight, refer to page 144.*

→ *Compass sensor, refer to page 18.*

Version /Si and SiH

As in common specifications.

→ *Outline dimension and weight, refer to page 144.*

→ *Compass included in the SiH version, refer to page 18.*

Version /S and RS

As in common specifications, except:

Transducer unit

The same unit is used for both the S and RS transponder.

Type	Kongsberg Maritime
Material	Aluminium / Bronze
Cable	15 m
Beamwith S / RS	approx. 60 deg. at -3 dB
Cable connector type for S / RS	4-pin Gisma plug: 10.00.1.04.2.10

→ *Outline dimension and weight, refer to page 144.*

Electronic unit

The same unit is used for both the S and RS transponder.

→ *Outline dimension and weight, refer to page 144.*

Stainless steel transponders

The models described in this section are only available in Stainless steel.

Version / DT

As in common specifications.

→ *Outline dimension and weight, refer to page 144.*

→ *Depth and temperature sensor, refer to page 18.*

Version / L-St

As in common specifications except:

Transducer material	Stainless steel / Polyurethane

→ *Outline dimension and weight, refer to page 144.*

Version / I-St

As in common specifications except:

Transducer material	Stainless steel / Polyurethane

→ *Outline dimension and weight, refer to page 144.*

→ *Inclinometer sensor, refer to page 18.*

Version / EEx

As in common specifications except:

Transducer material	Titanium

→ *Outline dimension and weight, refer to page 144.*

Version / EEx 90

As in common specifications except:

Transducer material	Titanium
Explosion proof classification	EEx d IIB T6

→ *Outline dimension and weight, refer to page 144.*

Octans module

Depth rating	Maksimum 4000 m
Unit material	Aluminium
Finish	Aluminium / Polyurethane
Operation temperature	0° to +30°C
External top connector type	4-pin Gisma plug: 10.00.1.04.2.10
External top connector type	7-pin Gisma plug: 10.00.2.07.2.10

→ *Outline dimension, refer to page 144.*

Compass (fibre optic gyrocompass)

Accuracy level	± 0.2°
Resolution	0.01°
Repeatability	±0.025°
Setting time	1 minute
Roll and pitch performance	0.01°
Supply voltage	19 - 35 V
Power consumption	12W / 0.5 A

Battery unit L24

This battery unit is used for powering to the the Octans module.

Depth rating	Maksimum 1000 m
Unit material	Aluminium
Finish	Aluminium / Polyurethane
Operation temperature	0° to +30°C
External top connector type	4-pin Gisma plug: 10.00.1.04.2.10

→ *Outline dimension and weight, refer to page 144.*

External Connectors and cables

Caution *Take care when wiring a unit. Incorrect wiring may cause irreparable damage.*

Connectors

Fibre-optic gyrocompass transponder

The MPT 319/SiH transponder, the Octans module and the Battery unit L24 for powering the Octans module, are fitted with external connector(s).

MPT 319/SiH transponder

The transponder holds one connector:

- For Octans connection - a 7-pins connector.

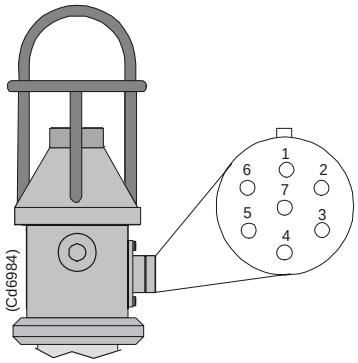


Figure 8 7-pin connector - layout

Pin no.	Function
1	TP Tx (RS–232)
2	TP Rx (RS–232)
3	
4	
5	
6	ON / OFF
7	GND

Octans module

The Octans module holds three external connectors:

- One for transponder connection - a 7-pins connector.

→ *Connector - pin layout, refer to the figure above.*

Pin no.	Function
1	Octans Rx (RS–232)
2	Octans Tx (RS–232)
3	GND
4	
5	
6	ON / OFF
7	GND

- Two for battery unit connection - a 4-pins connector.

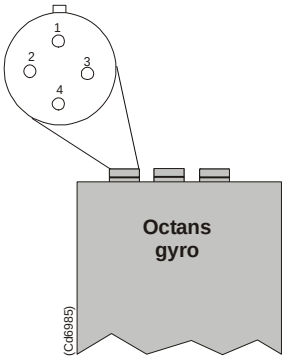


Figure 9 4-pin connector - layout

Pin no.	Function
1	24 V
2	GND
3	24 V
4	GND

Battery unit L24

The battery holds one connector:

- For Octans connection - a 4-pins connector.

→ *Connector - pin layout, refer to the figure above.*

Pin no.	Function
1	24 V
2	GND
3	24 V
4	GND

Floating collars

Depth rating	1000 m
Colour	Orange

→ *Outline dimension and weight, refer to page 144.*

Guiding collars

Depth rating	1000 m
Material	Polyethylene
Colour	Black / White

→ *Outline dimension and weight, refer to page 144.*

Mounting brackets

No technical data available. Depends on type of mounting brackets used.

SAFETY INFORMATION FOR TRANSPONDER AND TRANSPONDER BATTERY

Introduction

This section includes transponder safety information for the Kongsberg transponders with lithium battery and separate Kongsberg transponder lithium batteries. It also includes emergency procedures.

Product identification

Product name

All Kongsberg Maritime transponders with a lithium battery, and separate Kongsberg Maritime transponder lithium batteries.

→ *Refer to Kongsberg Maritime transponder instruction manuals for the actual model.*

Battery design

A transponder lithium battery consists of several battery cells that are electrical connected, both in serial and parallel.

A transponder lithium battery consists of two separate parts:

- Receiver part (Rx)
- Transmitter part (Tx)

There are transponder batteries with different number of cells, voltages and capacity.

→ *Refer to Kongsberg Maritime transponder instruction manuals for the actual model.*

All transponder batteries include protection against short-circuits (re-settable fuses) and reverse current (diodes).

Battery chemistry

A transponder lithium battery consists of cells with chemistry:

Lithium Thionyl Chloride - Li/$SOCl_2$

- Negative electrode: Lithium metal (Li)
- Positive electrode: Thionyl chloride ($SOCl_2$)
- Electolyte: Solution of lithium tetrachloroaluminate ($LiAlCl_4$) in thionyl chloride

Battery cell manufacturers / types

A transponder lithium battery consists of cells from one or two of the following types:

- Tadiran TL-2300
- Sonnenschein SL-780
- Saft LS 33600
- Saft LSH 20
- Sonnenschein SL-760

Hazards identification

General

Short-circuits, overheating, mechanical damage and exposure to water can start chemical reactions and high currents inside the transponder lithium battery. This can generate noxious gases and/or danger of explosions. The chemical reactions will continue without additional supply of oxygen, as the battery cells contain the necessary ingredients for maintaining the chemical reactions.

During operation, the battery is placed inside the transponder. Water ingression into the transponder can cause dangerous situations.

Danger of explosions

- If the cells that form the battery reach the critical temperature of 180° C, they will explode.
- **Water ingression** - The battery temperature will increase, caused by the high internal currents. The temperature can reach the critical point of 180° C.
- **Water ingression** - Electrolysis gives hydrogen. Together with oxygen, hydrogen can create oxyhydrogen gas inside the transponder (depends on the concentration). This gas is very inflammable/explosive.
- **Water ingression** - Chemical reactions in the battery will cause a pressure build-up inside the transponder. The transponder can explode if the inside pressure is high enough.
- If the transponder explodes, either the transducer or the bottom end cap will blow out, or the transponder becomes fragmented. This can cause serious damages on personnel and/or equipment.

- Some transponders have a relief valve that will prevent over-pressure. Noxious gases will then leak out of the transponder until the chemical reactions have stopped.

Note

The relief valve can be plugged, caused by products from the chemical reactions during an emergency as described above.

Noxious gases

- Thionyl chloride ($SOCl_2$)
- Sulphur dioxide (SO_2)
- Hydrogen chloride (HCl)
- Chlorine (Cl_2)

Signs and symptoms:

- Corrosive fumes with pungent odour, is very irritating to skin, eyes and mucous membranes. Over-exposure can cause symptoms of non-fibrotic lung injury and membrane irritation.

Inhalation:

- Lung irritant.

Skin contact:

- Skin irritant.

Eye contac:

- Eye irritant.

Ingestion:

- Tissue damage to throat and gastro/respiratory tact if swallowed.

Medical conditions:

- Eczema, skin allergies, lung injuries, asthma and other respiratory disorders may occur.

First-aid measures

All personnel that have been exposed to the noxious gases should immediately be seen by a doctor.

Inhalation:

- Remove from exposure, rest and keep warm.

Skin contact:

- Wash off skin thoroughly with water. Remove contaminated clothing and wash it before reuse.

Eye contact:

- Irrigate thoroughly with water for at least 15 minutes.

Ingestion:

- Wash out mouth thoroughly with water and give plenty of water to drink.

Fire-fighting measures

- **Cool down the battery with copious amounts of cold water.**
  - Transponder with lithium battery:
    * Immerse the transponder in the sea for 12 hours or permanent.
    * If this method is impossible, the transponder can be cooled down by use of a fire hose.
  - Separate transponder lithium battery:
    * Immerse the battery in the sea for 12 hours or permanent.
    * If this method is impossible, the battery can be cooled down by use of a fire hose.

Cooling down the battery with copious amount of cold water is the only way to reduce/stop the internal chemical reactions, or to limit the fire/explosions to as few battery cells as possible. The chemical reactions/fire will continue without additional supply of oxygen, so extinguisher like Lith-X will not work properly.

Applying water directly onto a battery, may develop oxyhydrogen gas, due to the possible electrolysis if the battery terminals are exposed to water. This gas is very inflammable/explosive. However, if the water cooling takes place out on deck, or in a storeroom with good ventilation, there will never be enough hydrogen gas to give oxyhydrogen gas (any gas will evaporate).

Personals protection

Fire/explosion:

- Use smoke-diving equipment.

Relief valve opens and noxious gasses come out:

- Use self-contained full-face respiratory equipment, and protective equipment of rubber or plastic.

Opening transponder with defect/possible defect battery:

- Use self-contained full-face respiratory equipment, and protective equipment of rubber or plastic.

Opening a *functioning* transponder:

- Use protective goggles.

Handling

Introduction

All personnel that handle transponders must know the transponder's status:

'***Functioning***' - '***Failing***' - '***Unknown***'

A Transponder with unknown status, must be handled as a transponder that is failing.

Recovering a '*functioning*' transponder

- All transponders recovered from the sea, should be placed in a safe place out on deck and controlled for minimum 2 hours:
  - Look for outer damages that could involve a water leakage.
  - The transponder housing temperature must be checked to verify a possible temperature increase in the lithium battery.

Recovering a '*failing*' transponder

- Handle as possible water ingression.
- Evacuate all unnecessary people.
- Recover the transponder with great precaution. Use a crane.
- No people should be near the transponder when it is lifted up on deck.
- Place the transponder in a safe place out on deck, shielded from people and vital equipment.

- Fasten the transponder in a crane, ready to lower it into the sea again.
- Control the transponder for minimum 2 hours:
  - Look for outer damages that could involve a water leakage.
  - The transponder housing temperature must be checked to verify a possible temperature increase in the lithium battery.

Failing and normal temperature:

- Take out the battery, see *"Opening a transponder with defect/possible defect battery*".

→ *Refer to page 31*.

Failing and increasing temperature:

- See *"Handling a heated or self-heated transponder*".

→ *Refer to page 30.*

Handling a heated or self-heated transponder

- Evacuate all unnecessary people.
- Fasten the transponder to a rope and immerse it in the sea for 12 hours or permanent.
  - If this method is impossible, the transponder can be cooled down with copious amount of cold water. Use a fire hose.
- Recover the transponder and control the temperature.
- Repeat this until the temperature is low and stable.
- The transponder can now be opened, see *"Opening a transponder with defect/possible defect battery*".

→ *Refer to page 31*.

Handling a transponder if the relief valve opens

- Evacuate all unnecessary people.
- Use necessary protection equipment.
- Fasten the transponder to a rope and immerse it in the sea for 12 hours or permanent.
  - If this method is impossible, the transponder can be cooled down with copious amount of cold water. Use a fire hose.
- Repeat this until no gases come out the check valve and the temperature is low and stable.

- The transponder can now be opened, see *"Opening a transponder with defect/possible defect battery"*.

→ *Refer to page 31.*

- Wash out chemical reaction products with water.

Opening a transponder with defect / possible defect battery

- The transponder is reported failing. There could have been water ingression in the transponder.
- Open the transponder in a safe place out on deck, shielded from people and vital equipment.
- Use necessary protection equipment.

Caution *Do not stand in front of transducer or bottom end cap, when opening the transponder.*

- If there has been water ingression, and the battery is still heated:
  - Disconnect the battery from the transponder electronics, and then see *"Handling heated or self-heated separate battery"*

→ *Refer to page 31.*

- Wash out chemical reaction products with water.

Opening a 'functioning' transponder

- The transponder is reported functioning.
- Open the transponder in a safe place out on deck, shielded from people and vital equipment.

Caution *Do not stand in front of transducer or bottom end cap, when opening the transponder.*

Handling heated or self-heated separate battery

- Evacuate all unnecessary people.
- Fasten the battery to a rope and immerse it in the sea for 12 hours or permanent.
  - If this method is impossible, the battery can be cooled down with copious amount of cold water. Use a fire hose.
- Wash out chemical reaction products with water.

Storage

Caution *A transponder that is failing, must be stored in a safe place out on deck, shielded from people and vital equipment.*

A transponders that is functioning, and separate batteries can be stored indoors.

- Storage temperature:
  - Recommended storage temperature lies between 0º C and +25º C (max +50º C, min -55º C).
- Storage relative air humidity:
  - Recommended relative air humidity is 40 to 70%.
- A transponder/separate battery must not be stored directly in the sunlight.
- A battery must not be exposed to water.
- For long term storage, the battery must be disconnected from the transponder electronics.
- Storeroom:
  - A solid room with study racks for transponders/separate batteries.
  - A room where no people are staying, or no vital equipment is placed.
  - Good ventilation.
  - Clearly identified.

Caution *A fire station, with fire hose (water), must be placed outside the storeroom.*

Ecological information

A lithium thionyl chloride battery does not present environmental hazard.

Disposal considerations

- A lithium thionyl chloride battery does not contain any heavy metals, and is therefore not regarded as special waste (contains only biodegradable parts).
- A used transponder lithium battery often contains a significant amount of residual energy. It is the danger of explosion that presents a problem when disposing a battery.
  - Used batteries must therefore be handled with the same care as new ones.

Caution *For safe disposal, contact a company that has been approved to collect and dispose lithium batteries.*

Transport information

All transponders with a lithium battery and separate transponder lithium batteries must be shipped in accordance with the prevailing regulations:

Transponder with lithium battery:

UN no. 3091, Class 9 Miscellaneous
(Lithium batteries contained in equipment)

Separate transponder lithium battery:

UN no. 3090, Class 9 Miscellaneous (Lithium batteries)

Transport:

Aircraft:	IATA DGR
Sea Transport:	IMDG Code
Railway:	RID
Road transport:	ADR

- Aircraft - Only new transponder lithium batteries can be transported by air.
- Aircraft - Transport of all transponders with new lithium battery and new separate transponder lithium batteries by air is only permitted onboard cargo aircraft. The goods must be clearly labelled:
  CARGO AIRCRAFT ONLY

Caution

Transponder with lithium battery - During transport the lithium battery must always be disconnected from the electronics.

- Original transponder/battery cages must be used.

OPERATION

General

The transponders are designed for operation in water only.

Caution *At delivery, the transponder battery is disconnected, and must therefore be connected before deployment.*

Safety information for transponder and transponder battery

→ *Refer to chapter on page 25.*

Connecting the battery

→ *Refer to page 52 for details.*

System set-up

All transponders are preset by the manufacturer. The channel setting may be changed if required. This can be done as follows:

- Use of internal switches, or
- use of acoustic telemetry from a HiPAP / HPR 400 system. (A HPR 300 system can not send telemetry for this purpose.)

For information about set-up of a transponder, refer to*:*

→ *APOS Instruction manual / APOS on-line help.*

Calibration

→ *Refer to page 71.*

Operation

General

The operation of the transponder is performed at the HiPAP / HPR (APOS) operator station. For information regarding operation, refer to:

- *APOS Instruction manual / APOS on-line help.*

Special operation instructions

The information in this paragraph applies only to the EEx transponders.

Caution *When you deploy or operate an explosion-protected unit, you must follow the respective national regulations and requirements.*

Transponder in use

Caution *All personnel that handle transponders must know the transponder's status:*

'Functioning' - 'Failing' - 'Unknown'

Caution *A Transponder with unknown status, must be handled as a transponder that is failing. For more information:*

→ *Refer to "Handling" on page 29.*

Pre-deployment checks

Before you deploy the transponder, you must:

1 Check that the battery contains sufficient power for the proposed operation.

2 Before deployment, perform a visual inspection of the transponder.

3 Perform a functional check to ensure it will operate correctly once it has been positioned on the seabed.

- Ensure the transponder replies to the correct interrogation frequency.

The functional check can be performed as follows:

Transponder in water - use the APOS function check. When checking, lower the transponder on a rope over the vessel's side.

→ *Refer to the APOS Instruction manual / APOS on-line help.*

Transponder on deck - use the Transponder Test and Configuration Unit (TTC 400).

→ *Refer to the TTC 400 Instruction manual / TTC 400 Quick Reference Guide.*

TPs with depth and temperature sensors

→ *Refer to page 74.*

Earthing an EEx transponder

An EEx transponder must have good earth connection. When a transponder is replaced, check to ensure that:

- The earthing strap is in good condition, and that it is firmly connected.
- The transponder has good earth connection.

Mounting

General

A transponder may be secured to a subsea structure using mounting brackets, or fitted with an anchor weight and floating collar for location on the open seabed.

→ *For more information refer to page 84.*

Mounting an EEx transponder

At deployment, ensure a safe mounting of the transponder with adequate mechanical protection.

Deployment

Caution *During deployment prevent the transponder from slamming against other solid objects.*

Caution *When you deploy the transponder, the anchor-weight must be lifted separately from the transponder. DO NOT attempt to lift both the transponder and the anchor-weight via the transponder - the transducer cage is only approved for lifting the transponder and the floating collar.*

When you deploy the transponder:

- The unit must be positioned with the transducer upright.
- Ensure a clear line of sight between the transponder's head and the ship's transducer.
- The transponder requires an anchor-weight/brackets to hold the transponder securely in position on the seabed / ROV.

→ *Refer to section on page 84.*

Release mechanism

- The transponder release mechanism must be attached to a shackle. The shackle will ensure a smooth release of the transponder when requested by the operator station.

Ready for operation

Once deployed, the transponder is ready for operation. The sensors in your application will respond to requests from the HPR / HiPAP system, when they are enabled using telemetry.

Positioning of a transponder

Positioning of a transponder can be done in two ways:

1 The normal way is that the topside send a request to the transponder, the transponder answer the request after a given time delay.

2 The other way is with the transponder in beacon mode, then the transponder acts as an acoustic lighthouse. It transmits pulses regularly (with a given Pulse Repetition Interval) without being interrogated.

→ *For more information, refer to the APOS on-line help.*

DT sensor

No special preparations for the user.

→ *For more information, refer to the APOS on-line help.*

Inclinometer sensors

The inclinometers' X and Y-axes are referenced to a flat area milled onto the top end cap. This is illustrated in the figure below.

- The Y-axis is parallel to the flat area and perpendicular to the longitudinal axis of the unit.
- The X-axis is perpendicular to both the longitudinal axis and the Y-axis.

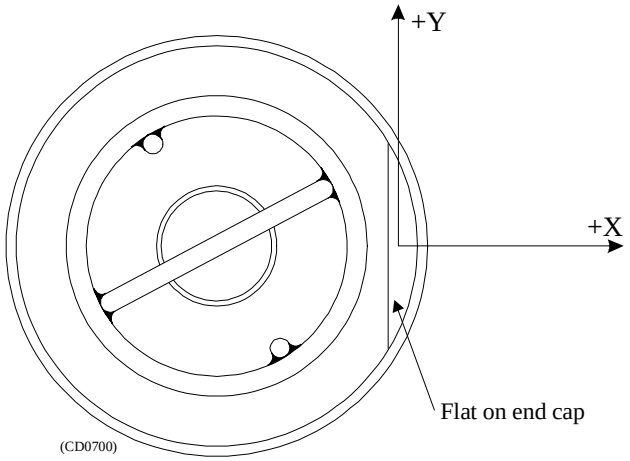


Figure 10 Top view of the inclinometer transponder, - showing the X/Y references

Compass sensor (magnetic)

General

Normally the steel around the compass transponder is heavily magnetic. Therefore, the compass of the transponder must be calibrated.

→ *Refer to Calibration on page 71.*

/H

- The Heading of the transponder is referenced to a flat area milled onto the top end cap. This is illustrated in the figure below.
- The Heading orientation is perpendicular to the longitudinal axis.

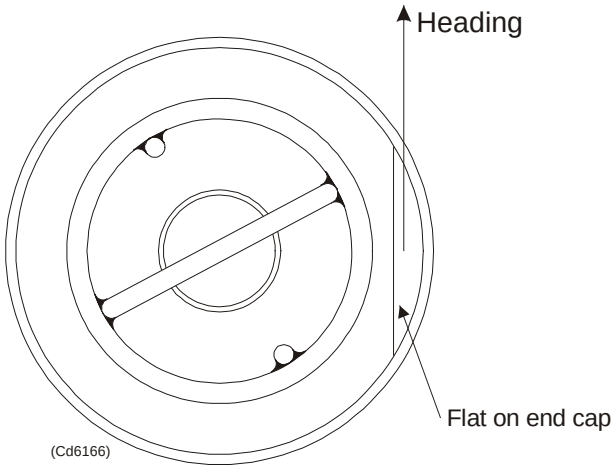


Figure 11 Compass transponder top - indication Heading orientation

/SiH

- The Heading of the transponder is the same direction as the Gisma plug is pointing.

→ *Refer to figure on page 135.*

Octans module orientation

- The Heading of the Octans module is the same direction as the Gisma plugs are pointing.
- At installation, ensure that the “direction-arrow” is pointing upwards.

→ *Refer to figure on page 90.*

Recovery

After recovery, wash the unit thoroughly in fresh water to dissolve any salt deposits and clean off any sand or silt. If available, an high pressure hose may be used.

→ *Refer to "Handling" on page 29.*

Caution *It is very important that the release unit (if fitted) is washed properly. Salt deposits, may prevent the mechanical part's mobility.*

Storage

→ *Refer to "Storage" on page 32.*

Caution *A release unit must be stored in open position (released), as illustrated in the figure below.*

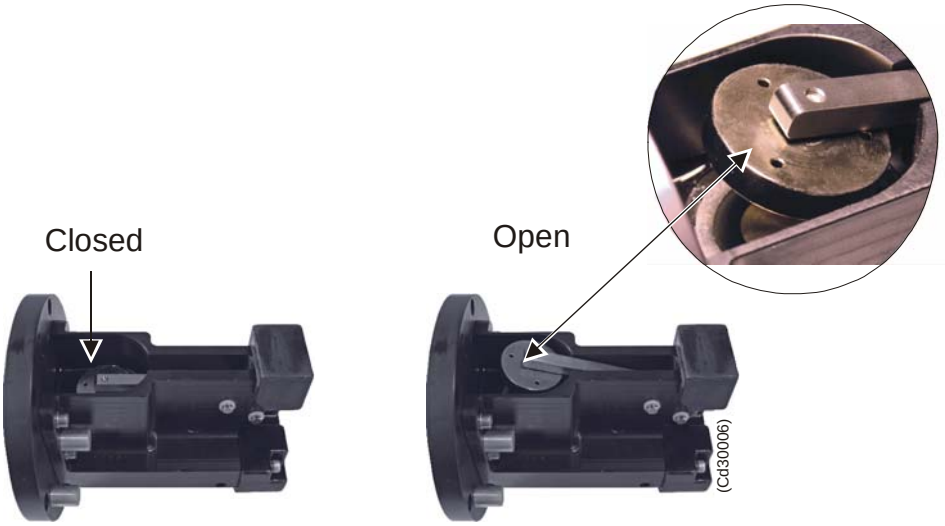


Figure 12 Release unit

→ *For information about manual release, refer to page 42.*

Release mechanism

General

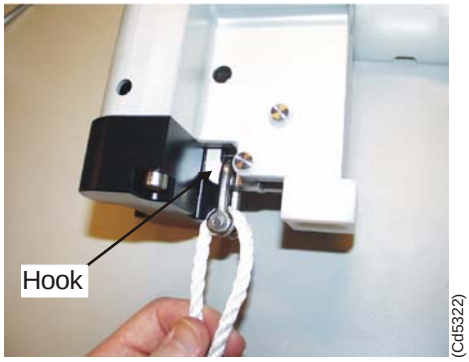
Note

Once the transponder reaches the surface, it can be lifted from the water by attaching a hook / rope to the transducer cage.

The release mechanism has two moveable parts. These are:

- Hook
  - The hook sits at the bottom of the release unit, and holds the shackle to be released.

Figure 13 Release unit indicating the Hook

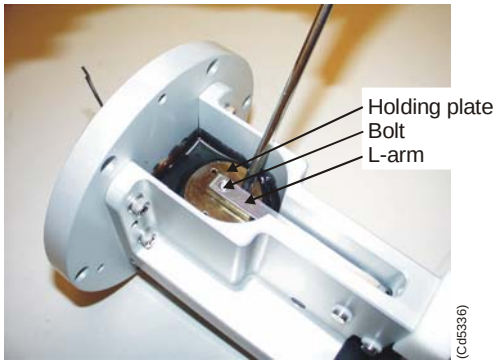


- L-arm
  - The L- arm is attached to the holding plate. (The holding plate has the shape of a very large coin, but much thicker).

Note

This holding plate has been adjusted during assembly and it MUST be loose. Do NOT attempt to tighten the bolt between the L-arm and the holding plate (see figure below).

Figure 14 Release unit indicating the L-arm and holding plate



The release mechanism can be operate in one of the two following ways:

- Automatic
- Manual

Automatic release

Automatic release is normally used when the transponder is submerged.

- The release is performed within 10-15 seconds after the command is performed.

Note *Once the transponder reaches the surface, it can be lifted from the water by attaching a hook / rope to the transducer cage.*

Manual release

Manual release is normally used for testing purposes.

Note *Do NOT try to pull the L-arm or holding the plate away from magnet.*

Manual release procedure

1 Look into the small hole near the lower end of the springs.
- The L-arm is just visible a few mm above the plastic ”foot”.

2 Insert a medium sized screwdriver between the L-arm and the plastic foot, and pry apart.

→ *Refer to figure 15.*
- The mechanism will snap open.

Note *The L-arm is balanced between a strong magnet and two springs. When the mechanism is released, it kicks open with a sudden movement. Keep your fingers clear of the back of the L-arm and holding plate.*

Figure 15 Release unit - indicating manual release

Setting the release mechanism

1 Ensure the anchor shackle (chain link etc.) is located in the jaws.

2 Snap the hook back onto position.

3 Fasten the required load onto the shackle.

4 Put the shackle onto the hook.

- Ensure right side up. The curved end **onto the hook** and the shackle bolt **away from** the hook.

→ *Refer to figure on page 41.*

5 Swing the hook into place.

- Ensure that the magnet face and the holding plate are free of grit and debris.
- For proper function, ensure good parallel physical contact between the magnet and holding plate.

6 Push the back of the L-arm and holding plate towards the magnet until the magnet catches the holding plate.

7 Ensure the holding plate covers the circular face of the magnet.

BATTERIES

General

The following battery types are available:

- Lithium (standard) (L)
- Alkaline (A)
- Rechargeable (N)

The transponders are normally self-contained with power. The standard battery is a lithium battery. It is used to ensure long life.

A battery consists of two sections, one for the receiver (Rx) and one for the transmitter (Tx).

→ *Safety information for battery, refer to the chapter on page 25.*

Specification

The battery specification includes:

- battery type
- Rx/Tx voltage
- number of battery cells used for Rx / Tx

Example: L10/36 (18/30)

The example given L10/36 (18/30), therefore indicates that this is a Lithium battery, with Rx voltage = 10 V / Tx voltage = 36 V. The Rx section comprises 18 battery cells, and the Tx section comprises 30 battery cells.

Battery replacement

The L10/36 (18/30) Lithium battery may be replaced by:

- the Alkaline battery A10/36 (24/24),
  or
- the Rechargeable battery N10/36 (18/30).

An overview of the capacities of these batteries are presented in the table below. A more detailed specification is presented on the following pages.

Battery capacity

Battery data	Lithium	Alkaline	Rechargeable
Battery Type no.	L10/36 (18/30)	A10/36 (24/24)	N10/36 (18/30)
Maximum continuous on-time	185 days	71 days	16 days
Quiescent time	1045 days	301 days	90 days
No. of replies, low source level	19.6 million	5.4 million	1.44 million
No. of replies, max source level	4.9 million	1.1 million	0.36 million

- The Alkaline battery capacity is approx. 20% of the Lithium battery.
- The rechargeable battery capacity is approx. 10% of the Lithium battery.

Battery at operation

The transponder has a battery monitoring function. For information on how to operate this function, see *the System operator manual / APOS on-line help.*

- Two pings are required to transmit the depth and compass information.
- Three pings to transmit the inclinometer information.
- When the transponder is set to HPR 400, and used for full telemetry, seven pings are required for each telegrams. The battery lifetime could therefore be much reduced from that stated in the figures below. However each reply is counted up and can be available to the operator.

APOS presents the battery status as ***High*** source level.

Note

When the battery is disconnected, the battery status will be lost. When the battery is re-connected, the battery status reading will indicate 100% (as for a new battery). To keep track of the consumption, you are advised to make a note of the battery status before disconnecting.

The figures in this section indicating the respective battery lifetime, shows the lifetime based on 10 ms pulse length.

Lithium battery packs

To calculate the battery status for the transponder lithium battery, use the following equations:

- Max source level = $\frac{High}{2}$
- Low source level = $High \times 2$
- Min source level = $High \times 4$

Battery type	Transponder type
L 10/36 (18/30)	SPT 319 series SPT 314 series MPT 319 series MPT 313 series MPT 319/DT-St
L 10/36 (15/20)	MPT 316/DT EEx MPT 316/ EEx 90
L 10/36 (36/60)	MPT 319/ L-St

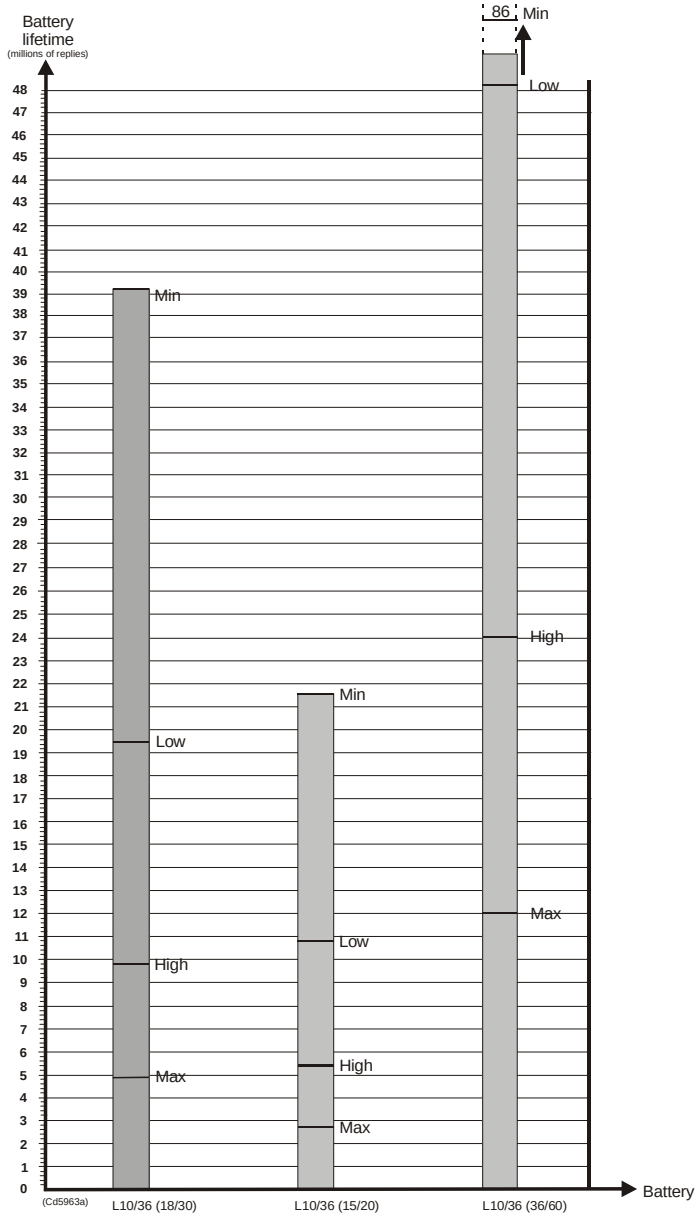


Figure 16 Battery lifetime at operation

Quiescent lifetime

This is the total time the transponder can listen for interrogation pulses. After this time the transponder will not be able to reply.

Max continuous on time

This is the maximum time the transponder can be continuously in operation, receiving and transmitting. If a low interrogation rate is used, this time may be consumed.

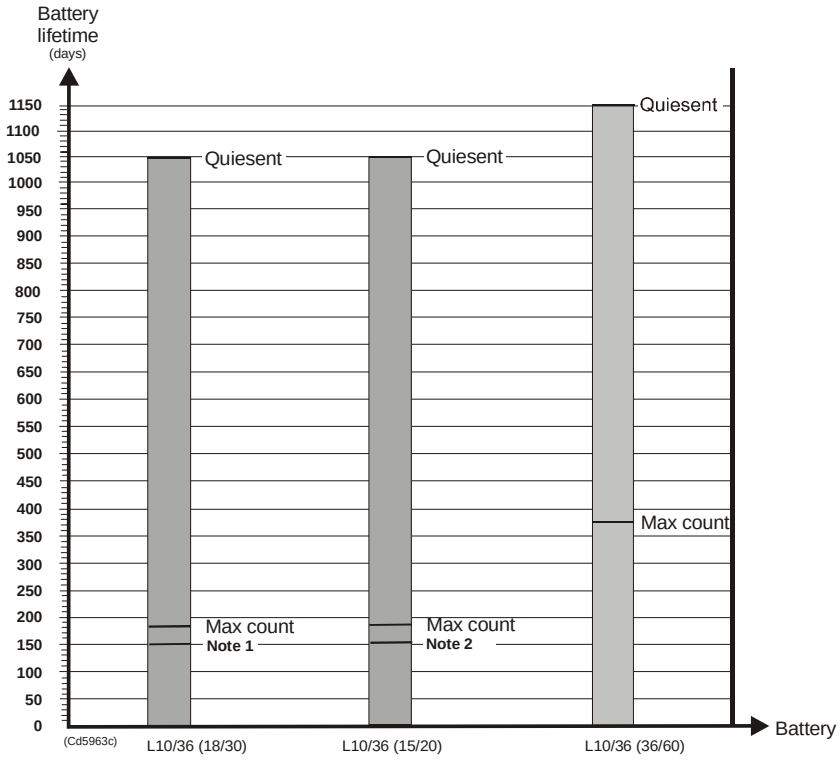


Figure 17 Battery lifetime at quiescent state

Note 1 - For the MPT 319/DT-St, when it is used as depth transponder with 1 (one) ping every 5 second.

Note 2 - For the MPT 319/DT EEx, when it is used as depth transponder with 1 (one) ping every 5 second.

Lithium battery storage

→ *Refer to "Storage" on page 32.*

Self-discharge depends on the temperature. The higher the temperature the greater the self-discharge over time.

Shelf lifetime:

The batteries may be stored for up to 10 years with little loss of capacity. The losses are approximately according to the figures below (room temperature):

Capacity loss: 1st year - 3%

Next 9 years - 1.5% per year

Note *Total capacity loss over 10 years will therefore be approximately 15%.*

Alkaline battery pack

An Alkaline battery, the Battery Pack A10/36 (24/24) is available. This battery pack may be used as a replacement for the transponder battery, L10/36 (18/30).

→ *Battery specification, refer to page 44.*

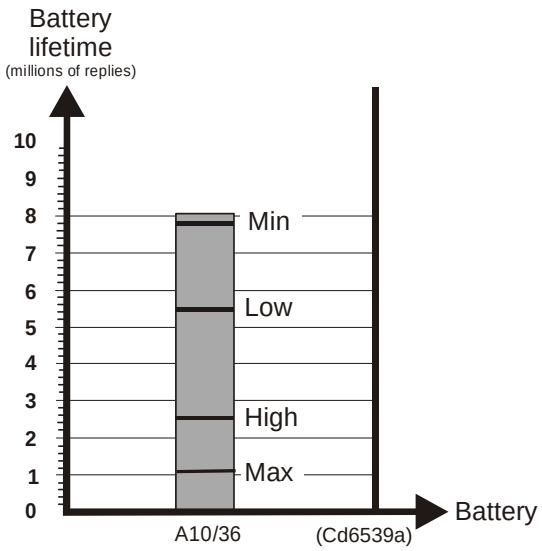


Figure 18 Battery lifetime at operation

Quiescent lifetime

This is the total time the transponder can listen for interrogation pulses. After this time the transponder will not be able to reply.

Max continuous on time

This is the maximum time the transponder can be continuously in operation, receiving and transmitting. If a low interrogation rate is used, this time may be consumed.

Battery lifetime at quiescent state

Max continuous on time:	71 days
Quiescent lifetime:	301 days

Alkaline battery storage

If the unit is not to be re-deployed in the near future, store it in a suitable environment.

Self-discharge depends on the temperature. The higher the temperature the greater the self-discharge over time.

Recommended storage temperature is room temperature or lower.

Shelf lifetime:

If the battery is stored in a dry place, (relative humidity < 65%), and with room temperature between 10 to 21 deg. C, up to 80% of initial capacity is still attainable after 4 years.

Caution *The batteries must be stored in an upright position.*

Rechargeable battery pack

General

A rechargeable battery Nickel Cadmium (NiCd), the Battery Pack N10/36 (18/30) is available. This battery pack may be used as a replacement for the transponder battery, L10/36 (18/30).

→ *Battery specification, refer to page 44.*

The Battery Pack N10/36 (18/30) and battery charger is described in a separate manual.

- The *BNC 1036 Instruction manual* (doc. no. 164039).

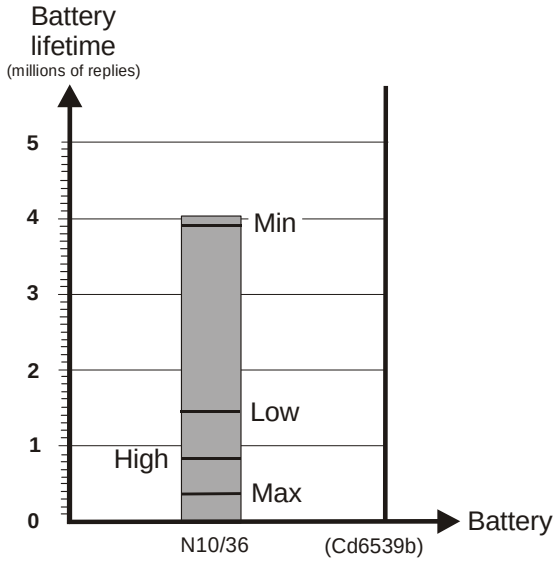


Figure 19 Battery lifetime at operation

Battery lifetime at quiescent state

Max continuous on time:	16 days
Quiescent lifetime:	90 days
Number of charge/discharge cycles:	250

Battery pack L24 (98)

General

This is the battery used for powering the Octans module.

→ *Battery specification, refer to page 44.*

Battery type	Lithium
Number of cells	98
Capacity	168 Ah
Voltage	24 V
Lifetime	336 hours

Storage

Lithium battery storage.

→ *Refer to page 48.*

Connecting the transponder battery

Procedure

To connect the battery, the unit must be opened.

→ *Refer to page 62 for details.*

1 Grab the connector firmly using both hands. Press the connector onto the battery plug.

- When connecting the battery, listen for the transponder initialization:
- **Three bursts** should be transmitted **at a rate of one per second**.
- If no **bursts** are heard, disconnect the battery immediately, and wait minimum 20 sec. before connecting / reconnecting it again.

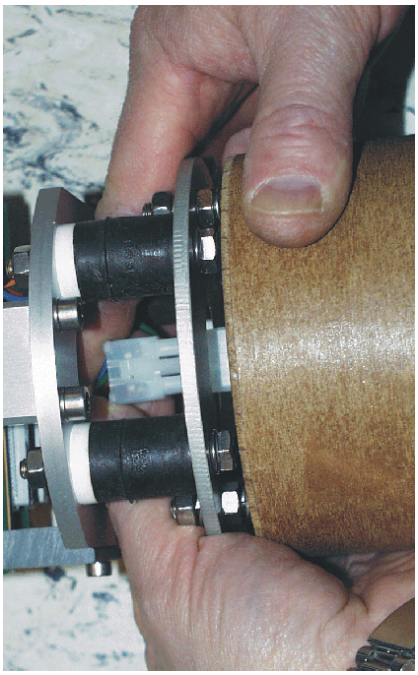

(Cd5937)

Figure 20 Connecting the battery

2 When the battery is correctly connected, assemble the transponder.

→ *Refer to page 70 for details.*

3 Check that the unit is correctly assembled and sealed.

4 Perform a functional check before deployment, to ensure it will operate correctly once it has been positioned on the seabed.

- The functional check is performed at the Operator Station.
- When checking, lower the transponder on a rope over the vessel's side.
- Ensure the transponder replies to the correct interrogation frequency.

Replacement of the transponder battery

To replace a Lithium battery / rechargeable battery, follow the procedure below:

To replace the battery, the unit must be opened.

→ *Refer to page 62 for details.*

1 If the transponder is fitted with a release unit, you must first disconnect and remove the release unit.

→ *Refer to page 69 for details.*

2 Unplug the connector from the battery by (see figure below):

- Support the connector with your left hand and use a screw driver to press the release knob, as you pull out the connector.

3 Remove the four nuts and locking washers holding the battery to the chassis.

4 The battery can now be removed from the chassis.

5 Replace the battery pack in the reverse order, as follows:

- Mount the four nuts and locking washers holding the battery to the chassis.

  → *Refer to figure on page 53.*

6 Connect the battery.

→ *Refer to figure on page 52.*

7 Assemble the transponder.

→ *Refer to page 70 for details.*

Note *Replace the used silica-gel bag with the new bag delivered with the battery.*

Note *When the battery is connected / disconnected the electronics is Reset.*

Note *After Hard reset / Reset, Tx power is set to:*

HPR 400 = HIGH

HPR 300 = MAXIMUM

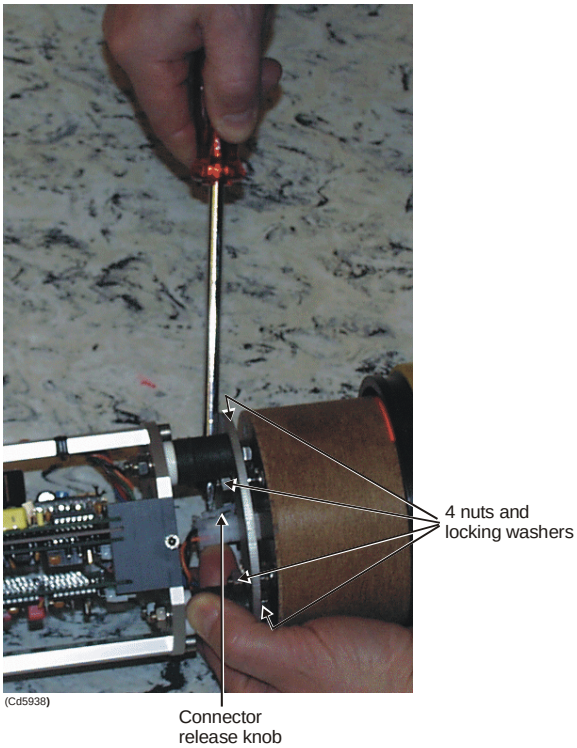


Figure 21 Battery connector and mounting screws

Replacement of the L24 battery

To replace the battery of the Battery pack L24 unit, use the same procedure as for replacement of a transponder battery.

→ *Refer to procedure on page 53.*

TRANSPONDER CONFIGURATION

General

All transponders are configured by the manufacturer. The configuration may be altered if required. The procedure to perform alterations will depend on the HiPAP / HPR system in use.

A transponder can operate with the following topside systems:

- HiPAP
- HPR 400 series
- HPR 300 series

- Each transponder series is dedicated to a specific frequency band.
- Altering the configuration, switching between the operating systems or changing the channel settings is done by:
  - Acoustic telemetry. (A HiPAP / HPR 400 system is required).
  - Use of internal switches. (Located on the microcontroller board).
- A large number of transponder channels are available (depending on the selected system) to prevent interference between transponders if several are located in the same area (a channel being an interrogation and reply frequency combination).

Frequency band

For the transponders described in this manual, the 30 kHz frequency band is used.

Acoustic telemetry - basics

For information on how to use acoustic telemetry in a HiPAP / HPR 400 system.

→ *Refer to the Standard command reference chapter in the System operator manual / APOS on-line help.*

Switch settings - basics

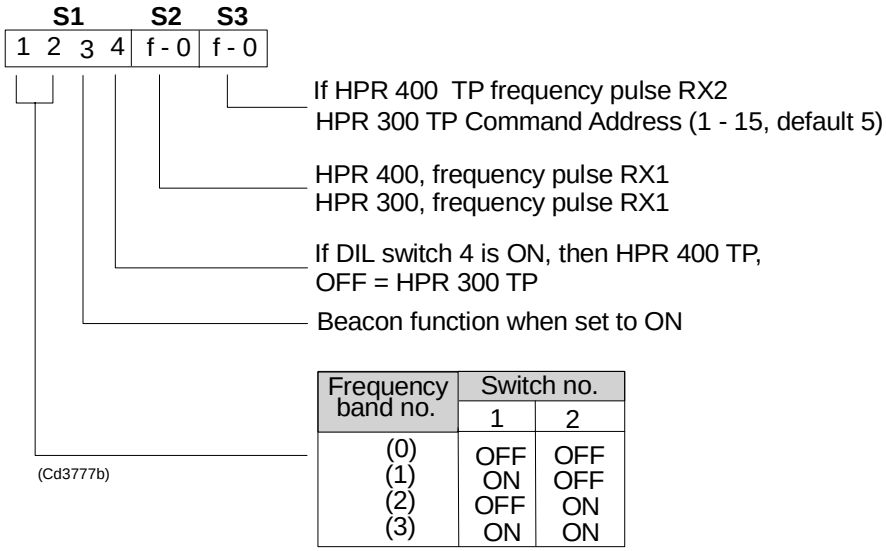
The switches for frequency and channel set-up are located on the microcontroller board:

→ *Ref paragraph on page 81.*

The set-up must therefore be done before unit installation, while the unit is open. The following switches are available; a 4-bit DIL switch and two 16-position rotary switches.

The set-up is described in figure 22 and the switches are used as follows:

- The DIL switches (S1 - four switches) select the system of operation.
- The rotary switches S2 and S3:
  - For the HPR 400 and the HiPAP systems - select the transponder operating frequency and channel.
  - For the HPR 300 series - set the interrogation frequency and command address.



Frequency band no.	Switch no. 1	Switch no. 2
(0)	OFF	OFF
(1)	ON	OFF
(2)	OFF	ON
(3)	ON	ON

Figure 22 Microcontroller board - switch settings

HPR 400 / HiPAP channels

An HiPAP system uses the same channel working principle as an HPR 400 system. The following paragraphs, therefore describe only the principles for an HPR 400 system.

The HPR 400 channel operation is the default. When set to HPR 400, the transponder executes all the commands for LBL and SSBL operation and subsea ranging. It also has an incorporated telemetry system.

Acoustic coding principle

The telemetry link uses a burst of seven pulses, all with different frequencies, transmitted in a sequence to make up a message. The coding principle is called “Factorial coding”, and has a total of 5040 combinations, used as follows:

- 4096 of these are used for defining a 12-bit message,
- while the remainder, 4097 to 5040, are spare.
  The spare combinations may be used for other messages such as ASCII transmissions and special single messages.

A complete telegram is constructed by sending several messages in sequence.

HPR 400 channels and positioning frequencies

The number of channels available with an HPR 400 system depend on the transponder type used.

→ *An overview of available channels and operating frequencies, is given in the APOS on-line help.*

Frequency band

- Rx frequencies used are: 21.000 - 24.500 kHz.
- Telemetry frequencies used are: 25.000 - 26.500 kHz, at 250 Hz intervals.
- Tx frequencies used are: 27.000 - 31.500 kHz.

The HPR 400 system interrogates the transponders by transmitting two pulses with frequencies according to the protocol. The transponder reply is determined by the second interrogation pulse (refer to figure 23). When the first interrogation pulse is an odd number (o) the reply is 250 Hz higher than it is when the pulse is an even number.

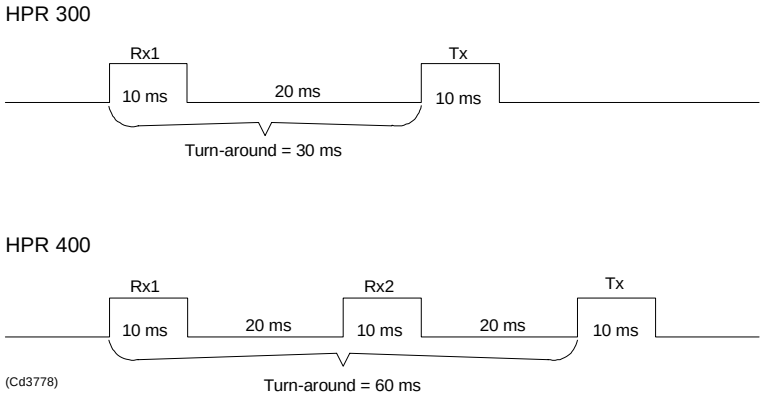


Figure 23 Transponder reception and transmission signal timing diagram

Referring to figure on page 56, the switch settings are:

DIP switches				
HPR	**S1-1**	**S1-2**	**S1-3**	**S1-4**
HPR 400	On	Off	Off	On
Rotary switches				
HPR 400	**S2**		**S3**	
	Set to the first digit of the desired channel number – Rx 1.		Set to the second digit of the desired channel number – Rx 2.	

Table 1 HPR 400 switch settings

HPR 300 channels

An HPR 300 system interrogates the transponders by transmitting one pulse with frequency according to the protocol.

→ *Refer to figure 23.*

The channels available are listed in table 2.

HPR 300 command function

The HPR 300 command function principles are the same for all the transponders described in this manual. In a HPR 300 system, the command system uses a combination of “Frequency shift keying” and “Pulse position coding”.

The commands are transmitted as a series of tone bursts, two frequencies being required to transmit the range of commands to each transponder. These are:

- An Individual Interrogation Frequency (IFF) - specific to the particular transponder.
- A Common Command Frequency (CCF) - common to all transponders.

The command information is contained in the delay between the IFF and the CCF signals, and in the CCF signal’s repetition period.

HPR 300 frequencies and switch settings

The HPR 300 system uses the Common Command Frequency (CCF) of 20 kHz, and has a total of 14 channel numbers (frequency combinations) available.

→ *An overview of channels and operating frequencies, see also the APOS on-line help.*

Switch S2 setting	Transponder channel number	Operating frequencies (kHz)	
		Interrogation (TP Rx)	Reply (TP Tx)
1	B01	20.492	29.762
2	B02	21.552	30.488
3	B03	22.124	31.250
4	B04	22.727	31.847
5	B05	23.364	32.468
6	B06	24.038	27.173
7	B07	24.510	27.777
8	B08	25.000	28.409
9	B09	26.042	29.070
A	B11	21.552	27.173
B	B22	22.727	28.409
C	B33	23.923	29.762
D	B44	25.126	31.250
E	B55	26.455	32.468

Table 2 HPR 300 frequencies and switch settings

The HPR 300 the switch settings are:

→ *Refer to figure on page 56.*

DIP switches				
HPR function	**S1-1**	**S1-2**	**S1-3**	**S1-4**
HPR 300	On	Off	Off	Off
HPR 300– Beacon function	On	Off	On	Off
Rotary switches				
HPR 300	**S2**		**S3**	
	Set to the interrogation frequency.		Set to the command address default setting – position 5.	

Table 3 HPR 300 switch settings

The system interrogates the transponders by transmitting one pulse with frequencies according to the protocol.

MAINTENANCE

General

No maintenance is normally required, apart from washing the unit. To change the battery pack, the unit must be dismantled.

Caution *For explosion-protected transponders, (stainless steel transponders) special maintenance is required. See paragraph below.*

To change the battery pack, the unit must be dismantled.

Safety information for transponder and transponder battery

→ *Refer to chapter on page 25.*

Preventive maintenance

Preventive maintenance is limited to keeping the unit clean.

Caution *Do not use high pressure water as this will damage the transducer face.*

- Remove all traces of salt and debris.
- Before any connectors are disconnected, ensure the surrounding areas are dry.
- Inspect the unit for damage at regular intervals. Pay particular attention to the transducer surface. This is manufactured of a synthetic rubber material, and can be damaged easily.

Maintenance for explosion-protected units

Explosion -protected electronic units must be subjects to regular safety check and maintenance. The time interval of these tests are depending on the operational and ambient conditions.

Flameproof units are protected against penetration of water to a certain extent, due to the joints. Therefore, special attention must be paid to the penetration of water in the unit.

Testing the transponder

A transponder may be tested for *short* periods on deck.

→ *Refer to page 35 for information on how to test a transponder.*

Caution *Continuous operation in air may cause the unit to overheat.*

Dismantling a transponder

General

This section includes separate dismantling procedures for:

- Aluminium transponders
- Stainless steel transponders

Before you open a unit:

1 Wash the unit thoroughly in fresh water, and dry off any moisture on the outside.

2 Place the transponder horizontally on a flat, clean work-bench, and support it so it cannot roll off.

Aluminium transponders

The pressure housing comprises of the cylinder body (housing), the transducer head and the bottom end cap. The transducer head includes the transducer, the top end cap and the transducer cage. The transducer head and the bottom end cap are both sealed into the housing, using two O-rings, and is held in position by the two semi-circular halves of an clamping ring. Two socked-head stainless steel screws are used to fasten together the two halves of each clamping ring.

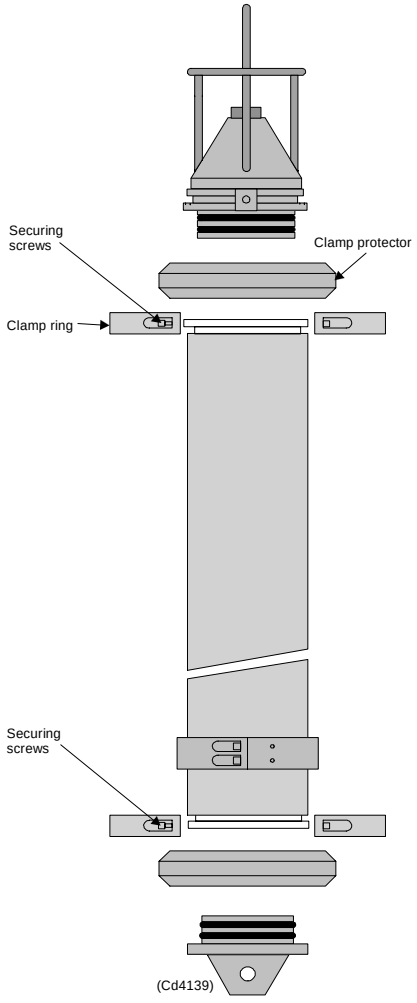


Figure 24 Example of a basic aluminium transponder pressure housing assembly

Opening the unit:

1 Remove the rubber clamp protector from the upper (transducer end) clamping ring.

2 Slacken the two securing screws and remove the two aluminium clamp pieces.

3 You are advised to use an extraction tool to remove the end caps (see figure below).

- The extraction tool is a special designed Kongsberg Maritime. tool, and it is not delivered with the transponder.
- The tool can be ordered from Kongsberg Maritime. Extractor tool - see figure below.

→ *Order no, refer to page 93.*

Note *DO NOT use a screw-driver or similar tool in an attempt to lever the end cap out. This will damage the protective anodizing on the housing leading to corrosion, and may also damage the sealing surfaces.*

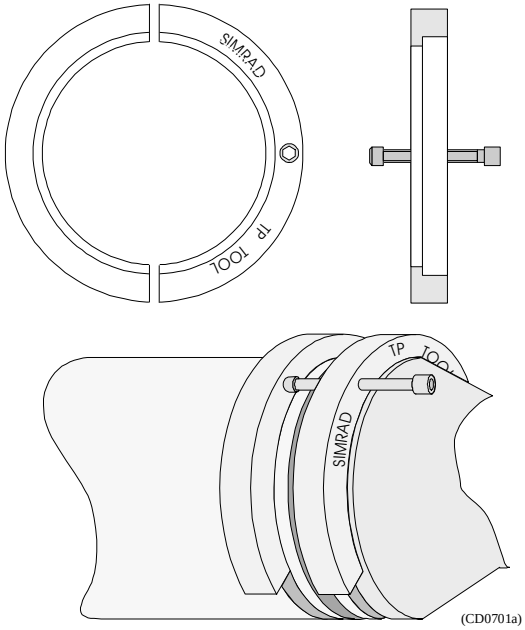


Figure 25 Simrad extraction tool

4 With the transponder housing held securely, place one semi-circular half of the extraction tool (the half with the screw and the text) over the square groove in the end cap which normally takes the clamping ring. The text on the tool should be facing “outwards”, away from the body of the transponder.

5 Place the other half of the tool over the square groove in the transponder body such that when the screw in the first half of the tool is tightened it will press against the centre of the other part.

6 Tighten the screw against the other part of the tool such that it pulls the transducer head (top end cap) out of the transponder body. The extraction tool may need to be slackened, rotated around the transponder body, then re-tighten during the course of the operation, to ensure the end cap is pulled out without damaging the transponder body.

7 Support the end cap as it is withdrawn. Once the O-rings are clear of the housing, the transducer head and electronics chassis will be loose and the tool may be removed.

Note *If the transponder is fitted with a release unit ensure that the wires connected to the release unit and battery pack are not damaged when withdrawing the chassis.*

Note *DO NOT attempt to "unscrew" the transducer head from the housing as the internal wiring and circuitry can be damaged.*

Note *DO NOT use a screw-driver or similar tool in an attempt to lever the transducer head out. This will damage the sealing surfaces resulting in water ingress.*

8 There is a wire from the release mechanism or the responder connector (whichever is fitted) to the base of the battery pack. Disconnect this wire from the battery pack before attempting to remove the chassis too far from the transponder housing.

Stainless steel transponders

The pressure housing comprises the cylinder body (housing) and the transducer head. The transducer head includes the transducer and the top end cap. The transponder is fitted with a cage.

The transponder head is sealed into the housing, using two O-rings, and is held in position by socked-head stainless steel (SMO type) screws.

→ *Refer to figure 26, where an MPT 319/DT-St is used as an example.*

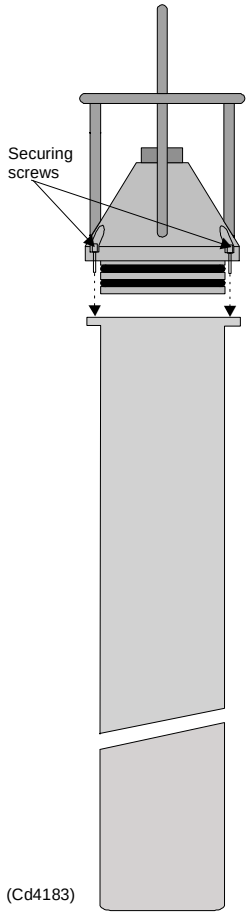


Figure 26 Example of a stainless steel transponder pressure housing assembly

Opening the unit:

1 Remove the securing screws that secure the transducer head into the housing.

a The EEx models have six securing screws.

b The /L-St, /DT-St and /I-St have four securing screws.

Note *DO NOT use a screw-driver or similar tool in an attempt to lever the end cap out. This will damage the sealing surface.*

2 Support the transponder head as it is withdrawn. No tool is to bee used. Just pull the two sections apart. Once the O-rings are clear of the housing, the transducer and electronics chassis may be removed from the housing.

Note *The socked head screws are manufactured of SMO steel, and must only be replaced by screws of the same material.*

Replacement of transponder circuit boards

Rx board, Tx board and microcontroller board

To replace one of these circuit boards, follow the procedure below:

1 Open the transponder.

→ *Refer to paragraph on page 62.*

2 Short-circuit the capacitor in the electronics chassis, to discharge the transmitter capacitors (use a 10 to 20 Ω resistance). The location of the capacitor may vary, depending on model.

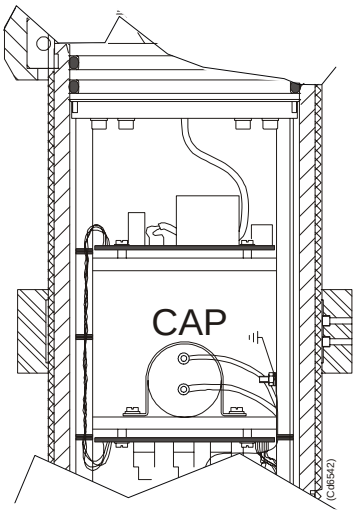


Figure 27 Part of a transponder, indicating location of the electronics chassis capacitor

3 Unscrew the plastic locking devices. The appropriate board can now be removed from the chassis.

Note

The Microcontroller board and Rx board are interconnected via a flat cable.

4 Mount the new circuit board and tighten the locking devices. Take care not to over-tighten the locks.

5 Assemble the transponder.

→ *Refer to paragraph on page 70.*

Rx-amplifier matching board and motherboard

To replace one of these circuit board, follow the procedure below:

1 Open the transponder.

→ *Refer to paragraph on page 62.*

2 Remove the soldering at the connections. Remember to mark the wires.

3 Unscrew the four screws holding the board. The appropriate board can now be removed from the chassis.

4 Assemble the transponder.

→ *Refer to paragraph on page 70.*

Replacement of batteries

Transponder battery pack

→ *Refer to page 53.*

Battery pack L24

→ *Refer to page 54.*

Replacement of transducers

General

The transducer is a sealed unit and can not be opened. If the unit is not working, the whole unit must be replaced. Separate procedures are provided for:

- Aluminium transponders
- Stainless steel transponders

Aluminium transponders

1 Open the transponder.

→ *Refer to paragraph on page 62.*

2 Remove the transducer cage. The cage is bolted to the “cone”, which is screwed onto the top end cap.

3 Remove the soldering at the connections Tp1 and Tp 2 on the Rx amplifier matching board (the Tp1 and Tp2 are clearly marked). Remember to mark the wires.

4 Remove the electronic chassis (8 fixing screws).

5 Remove the transducer securing screws. this is done from the inside of the top end cap.

6 Assembly is basically the reverse of dismantling.

Stainless steel transponders

1 Open the transponder.

→ *Refer to paragraph on page 62.*

2 Remove the transducer cage (if fitted).

3 Remove the soldering at the connections Tp1 and Tp 2 on the Rx amplifier matching board (the Tp1 and Tp2 are clearly marked). Remember to mark the wires.

4 Remove the electronic chassis (not necessary on the EEx transponders).

5 Remove the transducer:

a The EEx models have 6 securing screws.

b The /L -St and /DT - St have 2 securing screws.

6 Assembly is basically the reverse of dismantling.

Remove the bottom end cap / release unit

Note *This paragraph applies only to the aluminium transponders.*

When fitted, the release mechanism forms the bottom end cap of the pressure housing. Removing a standard end cap or a release unit, is basically the same. The end cap is sealed into the transponder housing. The procedure describes how to remove the release unit:

1 Hold the transponder body securely, and agitate the release unit back and forth in the housing to break the seal.

2 Pull the release unit out. The unit should seal tightly into the housing, so some force will be required to withdraw it.

Note *A 1,3 m length of cable is connected between the release unit and the battery pack. Ensure this cable is not damaged when withdrawing the unit.*

Note *DO NOT attempt to ”unscrew” the unit from the housing as the internal wiring and circuitry can be damaged.*

Note *DO NOT use a screw-driver or similar tool in an attempt to lever the unit out. This will damage the sealing surfaces resulting in water ingress.*

3 The release mechanism may now be removed. Once the O-rings are clear of the housing, it will be loos.

4 Disconnect the release unit from base of the battery.

5 Assembly is basically the reverse of dismantling.

Assembling a transponder

To replace the electronics chassis and battery pack into the housing, follow the procedure below:

Before you start:

1 Inspect the O-rings for damage. If in doubt, or if they have been used for more than one year, they should be replaced.

2 Place the new bag of silica-gel desiccant into the housing to absorb any humidity that may have entered the unit while it was open.

3 Ensure the mating surfaces and O-rings are *completely* clean, then wipe a thin film of non-acetic silicone grease or similar over the rings and mating surfaces.

Assembling:

1 Carefully insert the chassis into the housing. Do not allow the circuit boards to knock against the housing, and ensure no wires are trapped between the chassis and the housing or left protruding from the housing.

2 Ensure the bag of silica-gel is positioned such that it will not prevent the chassis from fully entering the housing.

3 When the O-rings on the end cap meet the lead-in chamfer at the entrance to the housing, support the base of the transponder unit and push firmly on the transducer top. Ensure the O-rings compress easily as the end cap enters the housing, and are not crimped or damaged.

4 When the end cap is fully home:

- For the aluminium transponders:
  - **a** Place the two clamp parts around the housing.
  - **b** Insert the two screws, and tighten them using a screwdriver-handled hexagonal key.
  - **c** Replace the rubber clamp protector.

Note

Do not over-tighten the screws by using a lever type key. (The clamp do not assist with the seal, they only hold the end caps in position.

- For the stainless steel transponders:

a Insert the securing screws, and tighten them using a screwdriver-handled hexagonal key.

5 Wipe off any excess grease and clean the unit.

6 Perform a final check to ensure all the screws are correctly tightened and nothing has been left out.

Calibration

Note *The calibration only applies to transponders including the compass function.*

Compass transponders

All compasses can perform well in a controlled environment, where the ambient magnetic field consists solely of the earth's field. In most practical applications, however, an electronic compass module is mounted in a host system that can contain large sources of local magnetic fields.

By performing the calibration procedure, you allow the compass to identify the major sources of these local magnetic anomalies and subsequently cancel out their effects when measuring the earth's magnetic field for computing compass headings.

Note *The compass has to be in the same position / conditions in calibration and operation mode. Different positions will result in varying accuracy.*
The calibration is performed at the HPR / HiPAP system. Refer to the System operator manual / APOS on-line help *for the calibration procedure.*

Source level adjustment

For certain applications, you may require to adjust the source level. This is done at the HPR / HiPAP system. For information on how to adjust the source level, refer to *the System operator manual / APOS on-line help.*

Octans module

Caution *The Octans unit is a sealed unit and must not be opened. If the unit is not working as expected, contact Kongsberg Maritime.*

MAIN PARTS

Transponders

A transponder consists of the following main parts:

- Transducer
- Housing
- Bottom end cap / Release unit (aluminium transponders only)
- Circuit boards
- Battery pack (described in a separate section)

→ *Refer to page 44.*

→ *An example of the transponder's main parts is shown in the figure on page 73.*

Note

The design (placement of circuit boards) of the SPT 319/H transponder vary from the other models. On this transponder the Rx amplifier board is mounted differently, to make room for the Compass sensor.

→ *Refer to figure on page 105.*

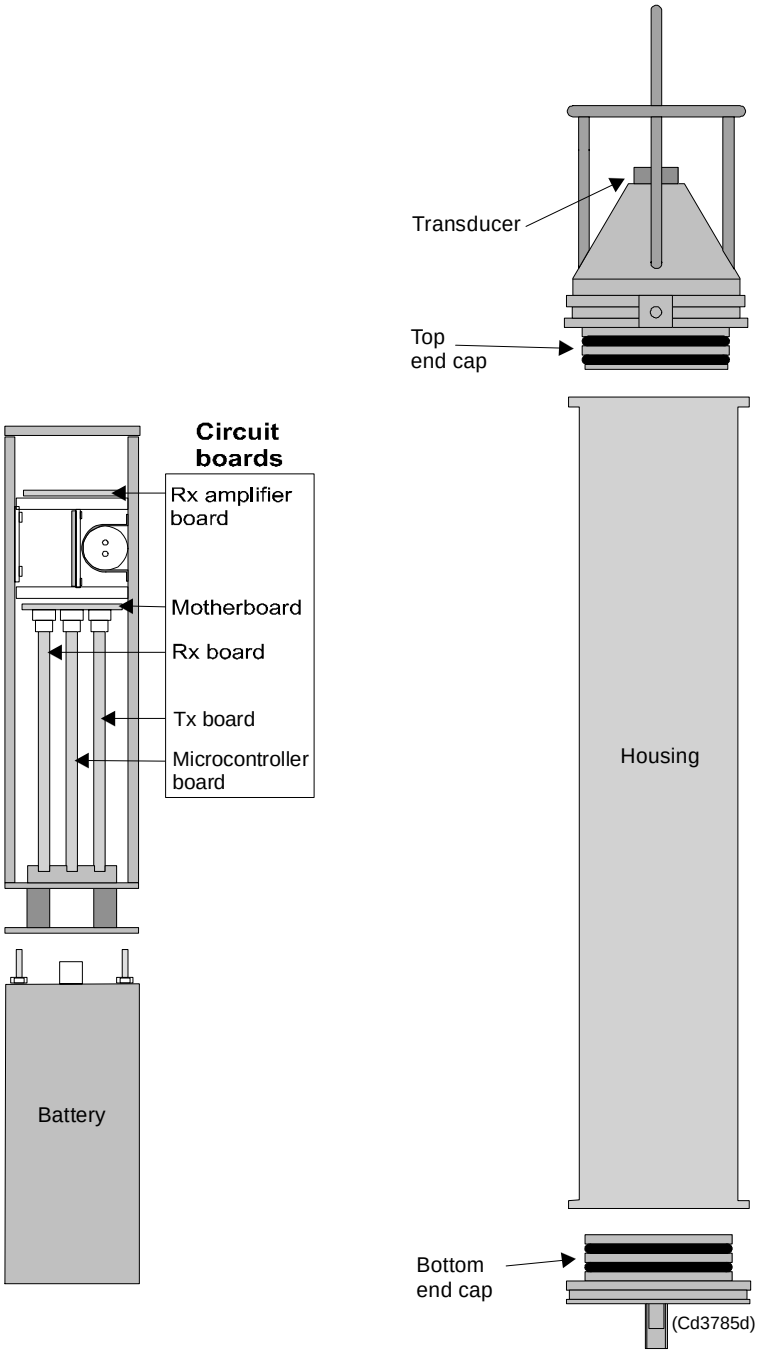


Figure 28 Example of an /TD aluminium transponder - main parts

Transducer

The transducer is mounted in one end of the cylindrical transponder. The following transducers are used:

- The transducer 90 (+- 45) has a 90° conical beam.
- The transducer 120 (+- 60) has a 120° conical beam.
- The transducer 180 (+- 90) has a 180° conical beam.
- The transducer 60 (+- 30) has a 60° doughnut shaped (horizontal) beam.

Depth and temperature sensors

For transponders with Depth and temperature sensors the transponder head is equipped with a hole to enable direct contact between the sensors and the sea water.

Note *Ensure that this hole is kept clean and open at all times.*

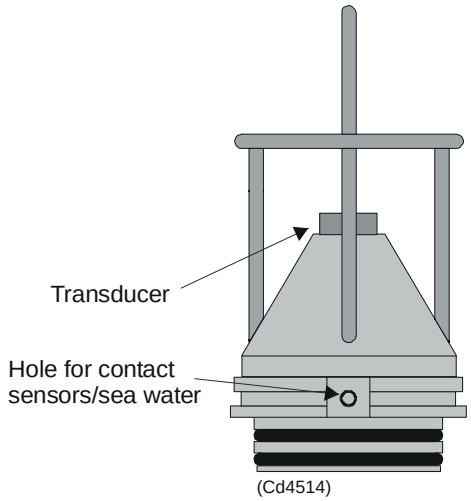


Figure 29 Transponder head for transponder with Depth and Temperature sensors

Housing

For information on the housing, refer to *Technical specification.*

Bottom end cap / Release unit

The following end caps are available:

- A standard bottom end cap, that includes a pressure relief valve and a shackle.
- An end cap including the release mechanism (manually reset).

Circuit boards

Circuit boards

The transponder electronics comprises of the following five printed circuit boards.

→ *Refer to figure on page 73.*

- Transmitter board (Tx)
- Receiver board (Rx)
- Rx amplifier board
- Microcontroller board
- Motherboard

Transmitter board (Tx)

The Transmitter board is a general purpose transmitter, containing its own frequency generator, power control and power supply circuits, (the board feeds both the receiver and microcontroller circuit boards.

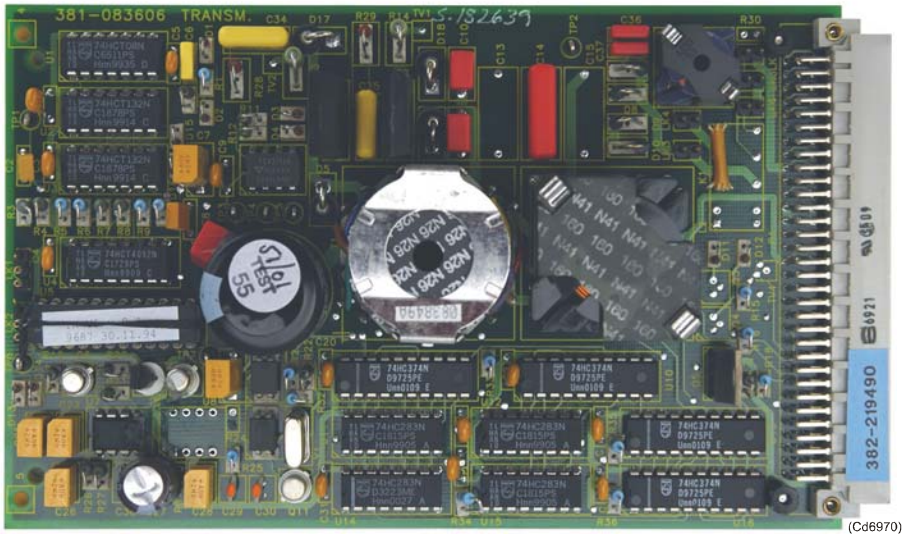


Figure 30 Transmitter circuit board

→ *Refer to figure on page 77 for the block diagram.*

The board holds two voltage regulators which output the voltages required by the other boards. It also has a crystal oscillator which is used as the Tx frequency source, and a direct numerical synthesizer for generating the correct Tx frequency. Driver stages with power control, an output stage with over-current protection, and transducer matching circuits, complete the board.

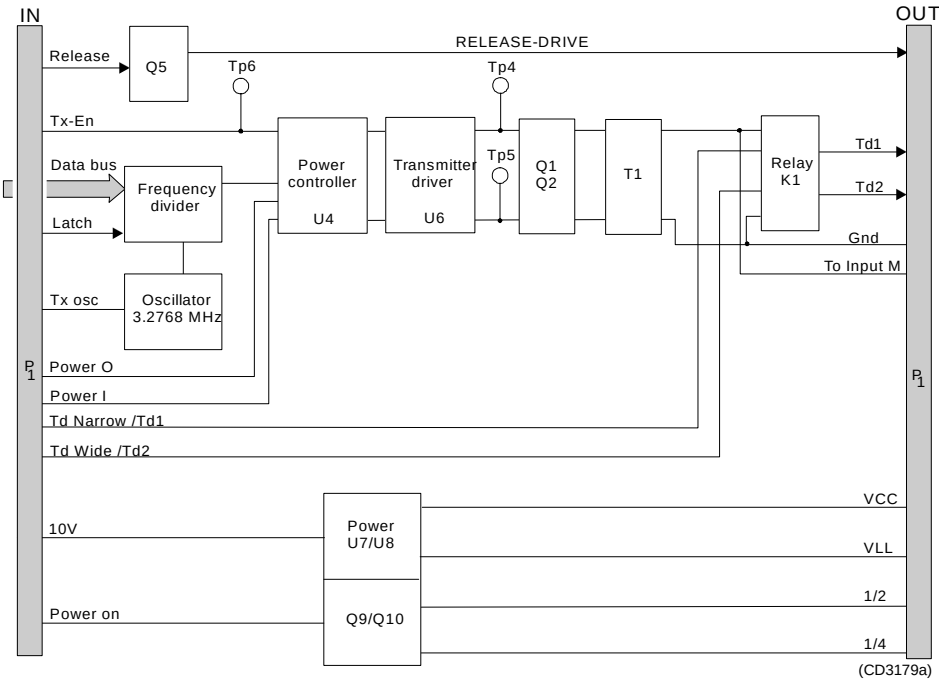


Figure 31 Transmitter circuit board - block diagram

Receiver board (Rx)

The receiver board is designed to receive transponder interrogation signals and telemetry signals. It contains nine narrow-band channel receivers, and a WIDE-detector and phase-locked loops for generating the right modulation frequencies to the channel receivers.

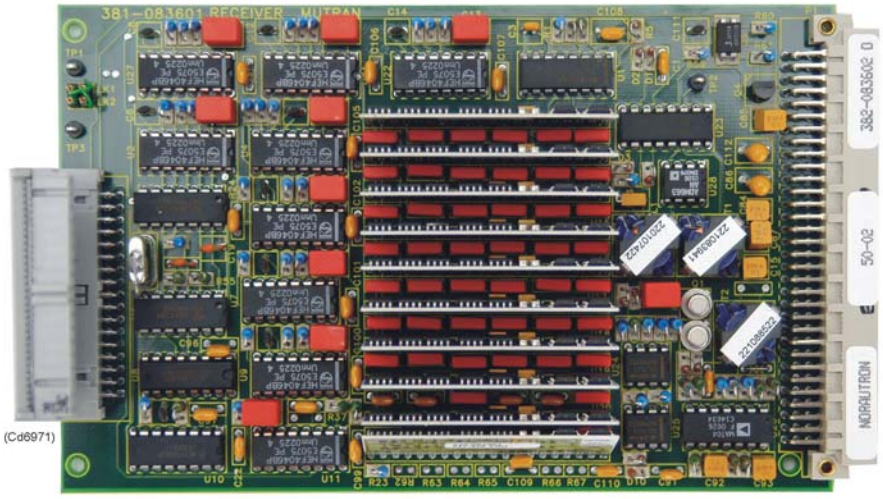


Figure 32 Receiver circuit board

→ *Refer to figure on page 79 for the block diagram.*

The board consists of a two stage amplifier with signal limitation and an anti-aliasing filter, two channel receiver stages for wake-up, and seven channel receiver stages for telemetry, all constructed as ceramic hybrid circuits. The channel receivers perform mixing, low-pass filtering, summing and envelope detection. The outputs from the channel receivers are fed to the microcontroller.

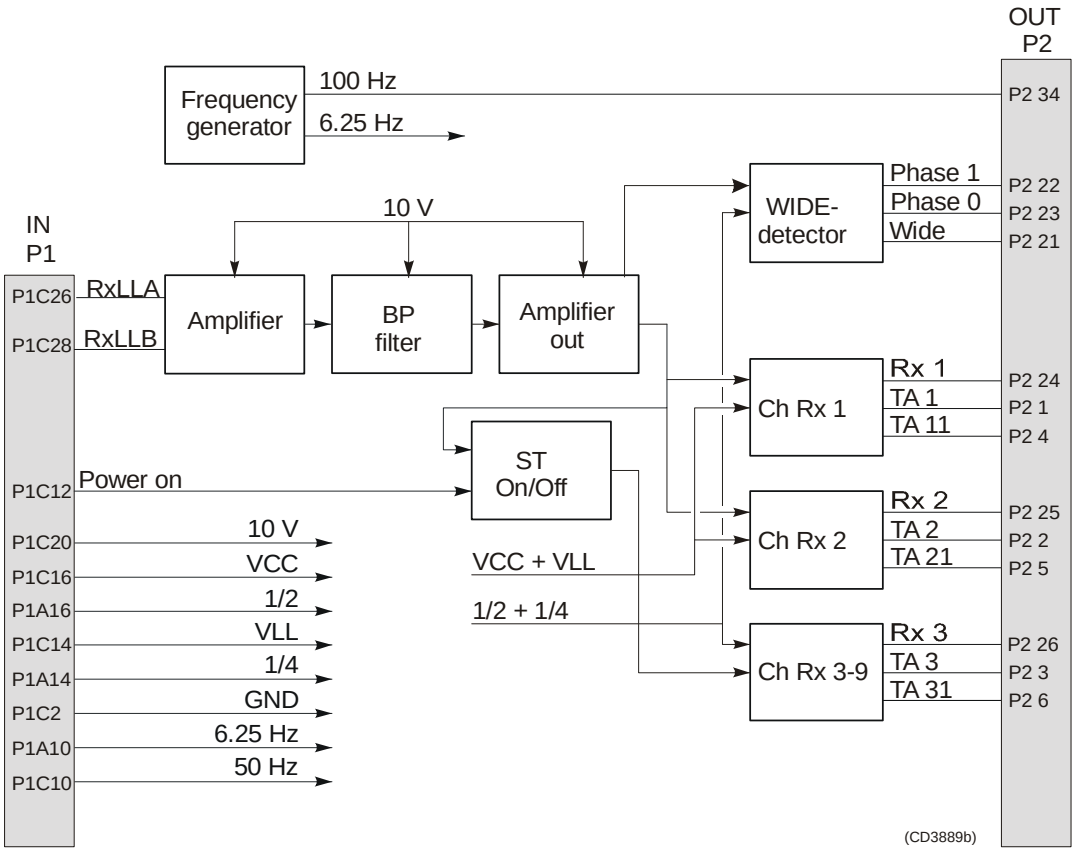


Figure 33 Receiver circuit board - block diagram

Rx amplifier matching board

The TP-PREAMP 24K Hz acts as a matching preamplifier between the transducer and the Channel Receiver circuit board.

→ *Refer to figure 34 for the block diagram.*

The transducer is connected to TP1 and TP2.

The incoming signal passes through the matching component, T1. From T1, the input signal is connected to a two-step amplifier.

The first step of this amplifier is a low noise FET with a voltage gain of approximately 10 dB.

The signal then enters the micropower operational amplifier, where the gain can be altered in two steps; either 0 dB or 6 dB (approximate values). A logic “0” at TP7 causes 0dB to be achieved. A logic “1” at TP7 causes 6 dB to be achieved.

The amplifier contains a bandpass filter to reduce the input noise before the signal is connected to the output transformer T2. The output to the Rx board is on TP8 and TP9.

TP5 and TP6 are connected to the Transmitter board. When the system is transmitting, a TR-switch in the T1 block protects the input of the amplifier. Transmitted signals are transformed via T1 and leave the board from terminals TP1 and TP2.

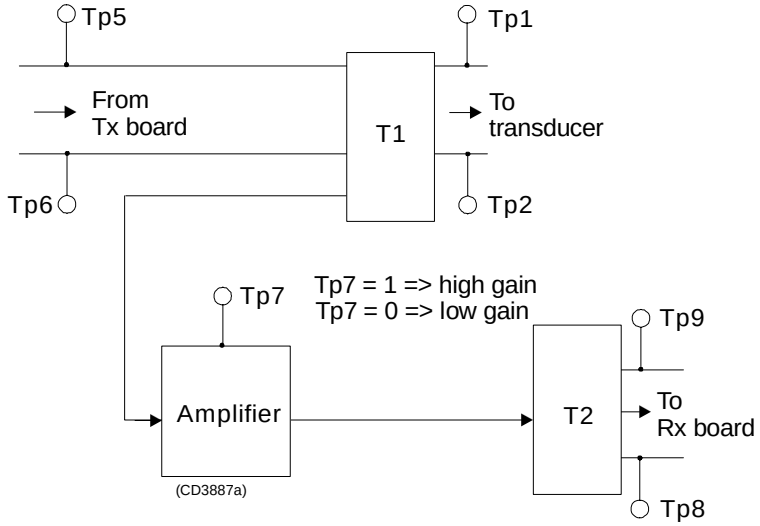


Figure 34 Rx amplifier matching board - block diagram

Microcontroller board

The Microcontroller board is a general purpose single microcontroller board, with the main task of performing calculations and digital signal control. It uses the *87C196KC/KD Microcontroller* manufactured by Intel, and is also equipped with a number of timers, inputs and outputs.

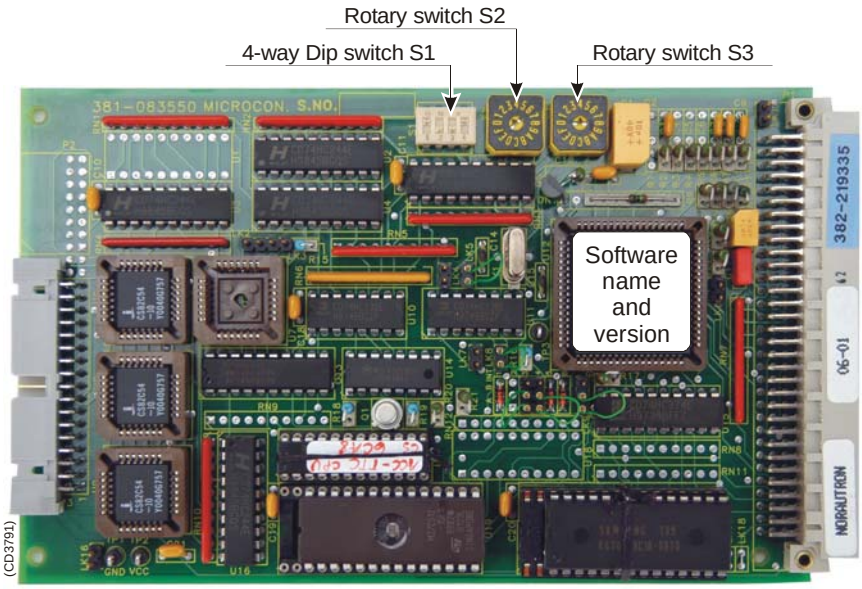


Figure 35 Microcontroller circuit board - switch locations

→ *Refer to figure 36 for the block diagram.*

The 87C196 microcontroller is the main component on the board. It can be run in different modes such as active, idle and power down, the inactive modes being used to save power. The microcontroller performs all the calculations and controls all the board's inputs and outputs. The timers on the board are used for dividing down the off-board Phase-Locked-Loop frequencies, controlling the receiver frequency channels.

Switches

The board carries one 4-way Dip-switch block and two 10-position rotary switches:

- The Dip-switch block is used to set the system's operating frequency band.

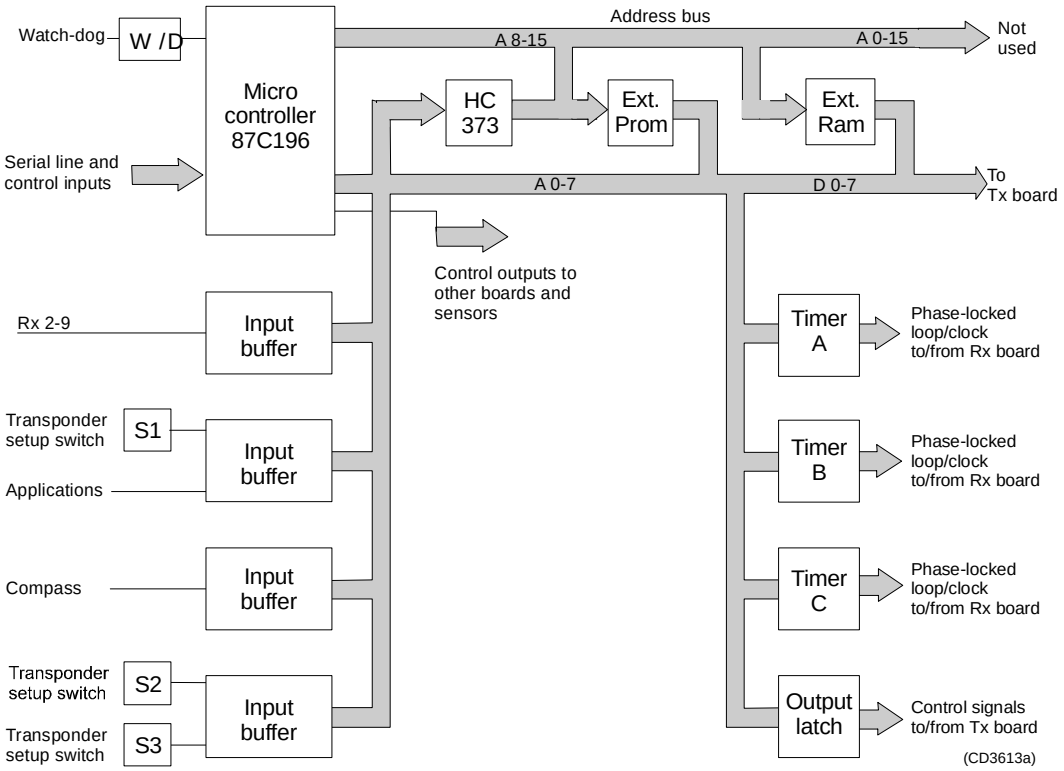


Figure 36 Microcontroller circuit board - block diagram

Motherboard

The motherboard contains all the input/output interfacing for the transponder. It has an interface connection (P4) for the two inclinometers and a + 10 V supply which is turned on only during processing to conserve battery life. It also carries an interface plug (P5) for the Depth/Temp serial line. The TTL interface is buffered through U1 on the motherboard.

Interconnections

The interconnections will differ from tp model to tp model.

Note

For details of the interconnections between the circuit boards, the transducer and the electronics, and the battery and the electronics, contact Kongsberg Maritime.

AUXILIARY EQUIPMENT

General

This section describes various types of auxiliary equipment that may be used to secure a transponder.

Anchor-weight

A transponder requires an anchor-weight of approximately 60 to 70 kg to hold the transponder securely in position on the seabed. Use a length of rope 3 to 15 metres long to attached the anchor, and then attach a suitable shackle to the ”top” of the rope. (The length of the rope depends on the transponder use.)

- If you use LBL with very long base line in deep water, use up to 15 m.
- If you use SSBL on a flat seabed, a 3 m rope is sufficient.

Floating rope

A floating rope may be used when collecting the transponder by an ROV.

→ *Refer to example in the figure on page 88.*

Auxiliary equipment supplied by Kongsberg Maritime

Kongsberg Maritime may supply the following:

- Floating collar
- Mounting brackets
- Guiding collars
- Extension shaft with candelabrum

Floating collar

The collar is divided lengthwise into two halves. These halves are placed around the transponder housing and bolted together, enabling the collar to be assembled onto a transponder without removing the end cap clamping ring. The ID-clamp ring may be used to hold the collar up against the top clamping ring on the transponder.

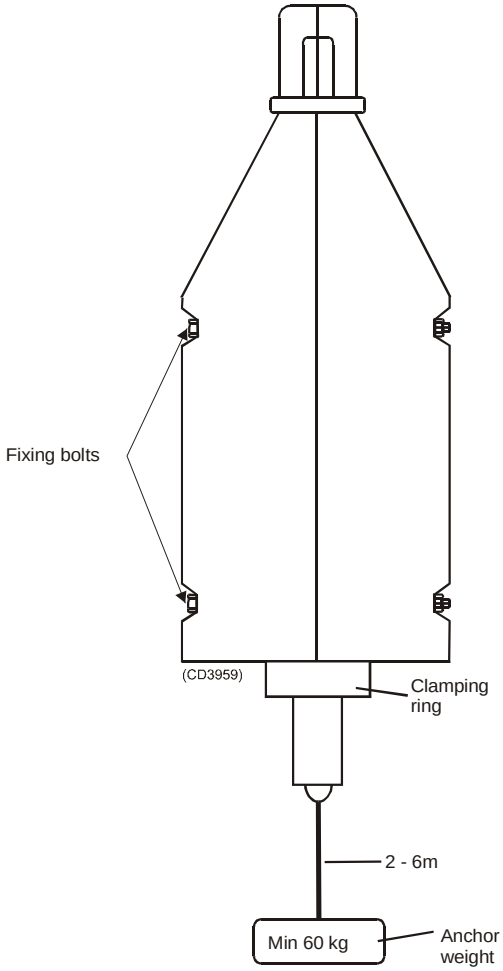


Figure 37 Transponder floating collar

Mounting brackets

Different types of mounting brackets are available. This section presents a few examples:

- Mounting funnel
- Transponder rack (may be supplied by Kongsberg Maritime).

Mounting funnel

The figure below gives an example of how to mount a transponder using a mounting funnel. The funnel may have a closed or open bottom, depending on requirements. The mounting funnel material is chosen based on the customer's input regarding installation construction and transponder placement.

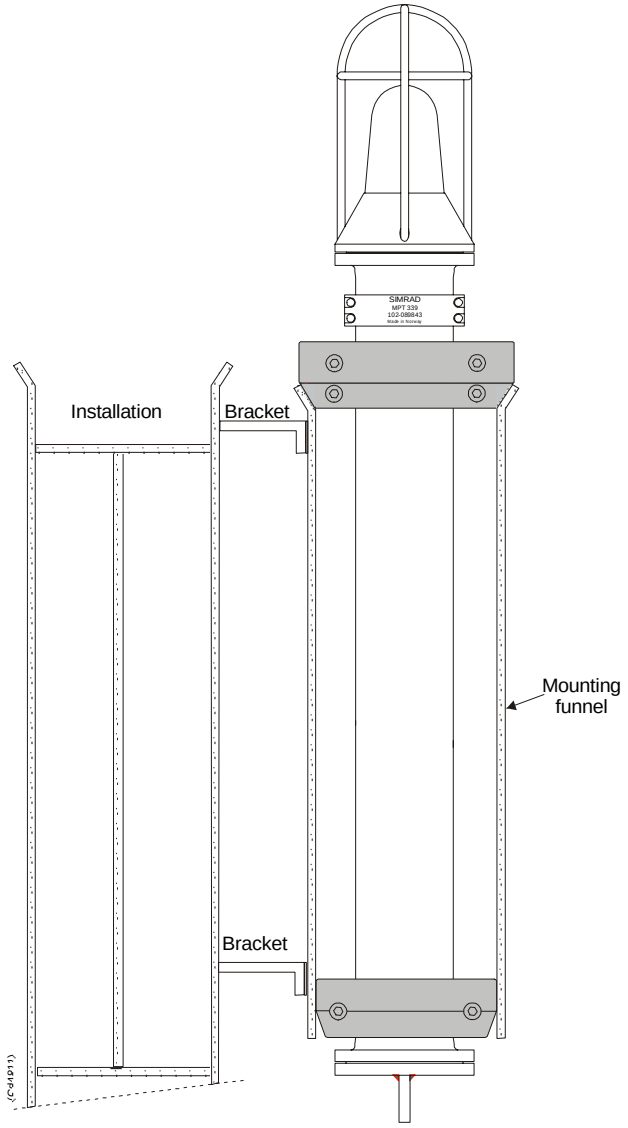


Figure 38 Example of mounting funnel

Transponder rack

The transponder rack illustrated in the figure below, may be used to mount an inclinometer transponder on a Kill and choke line. This type rack can not be used with an ROV.

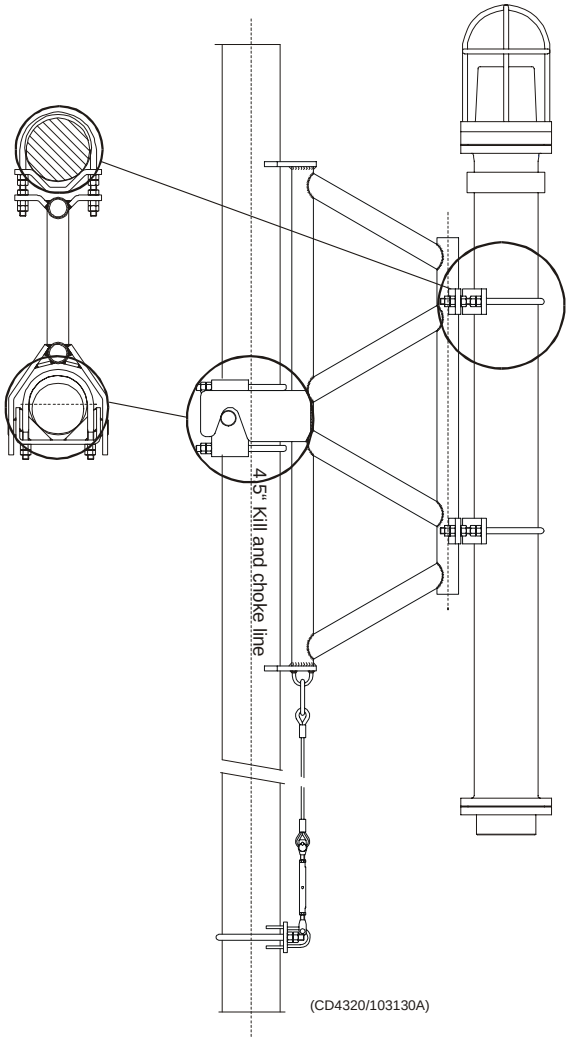


Figure 39 Transponder rack

Guiding collar

Different types of guiding collars may be used. The most common guiding collar delivered by Kongsberg Maritime comprises of two separate units; an upper and a lower. Each unit is divided into two parts. These parts are placed around the transponder housing and bolted together. It is important that the collar units are mounted correctly.

→ *This is illustrated in the figure on page 88.*

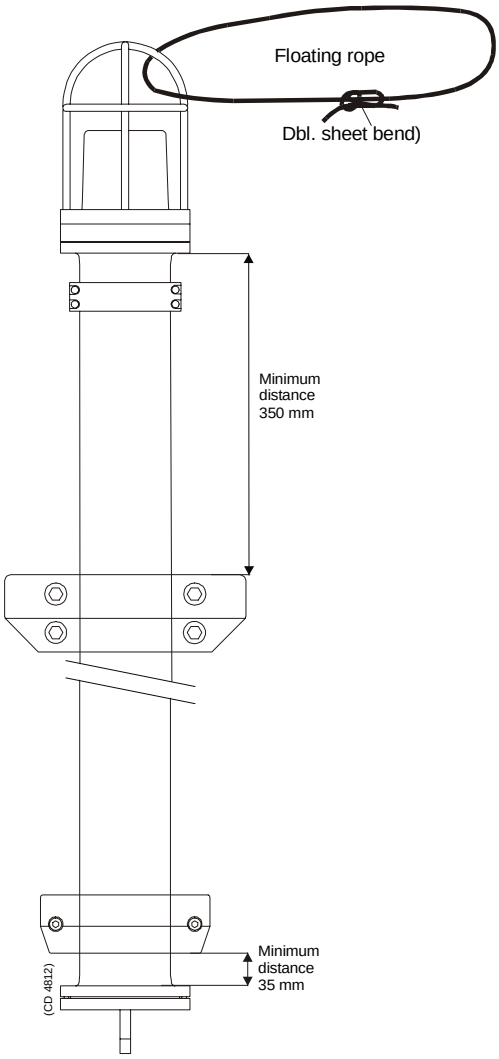


Figure 40 Example of transponder with fitted guiding collar and floating rope

Note

Other types of guiding collars may be supplied on request.

A groove (12 mm wide) is made on the upper guiding collar unit.

Example of use:

The purpose of this groove is to fit the transponder correctly when using a funnel for mounting the transponder. The groove slides over a corresponding guide fin within the funnel. Correct mounting will restrict rotation of the transponder within the funnel. The funnel is equipped with a locking pin to secure the transponder (not supplied by Kongsberg Maritime).

Transponder extension shaft with candelabrum

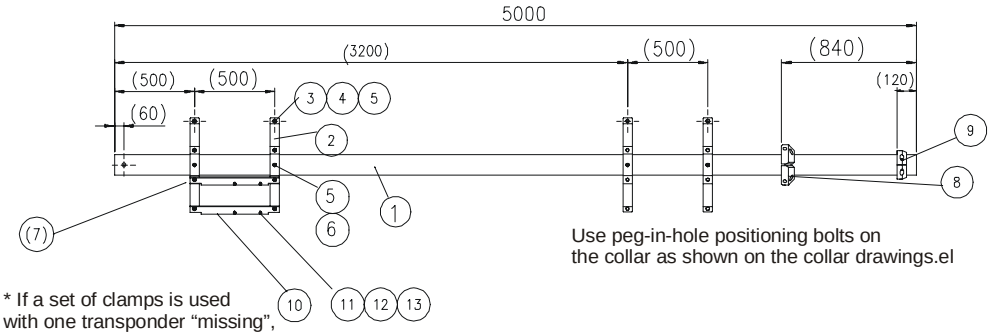
The shaft has brackets for mounting of one compass transponder, one Octans module and two Battery units L24. All materials are of non-magnetic type.

→ *Refer to figure on page 90.*

The shaft is designed to be handled and installed by a ROV into a funnel, and it has guidance arrangement for aligning the transponder(s) relative to North.

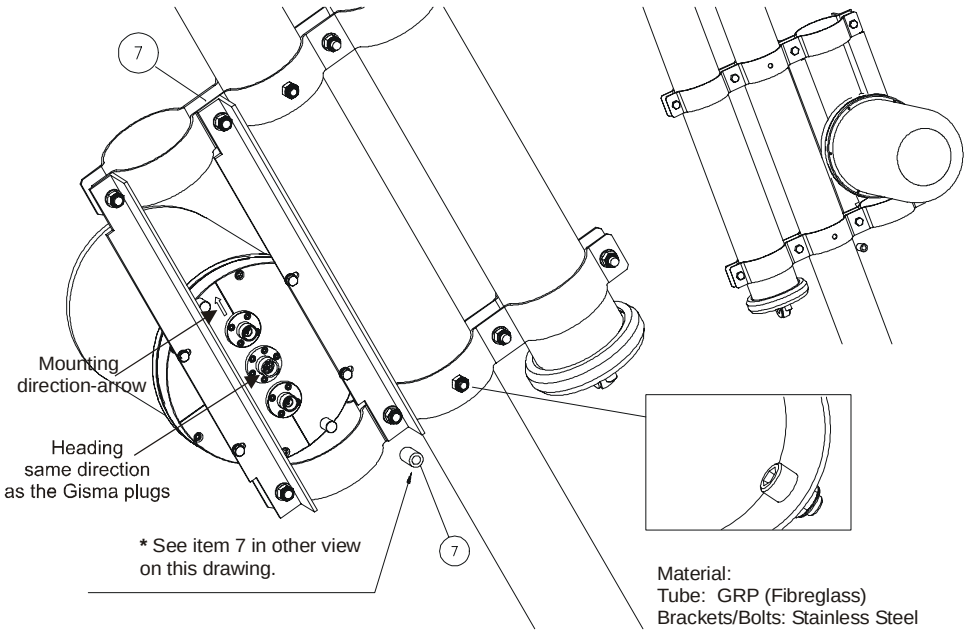
Orientation:

The Heading reference for the compass transponder and the Octans module must be in the same direction as the orientation guide on the shaft. This must be done to coordinate the different units / modules.



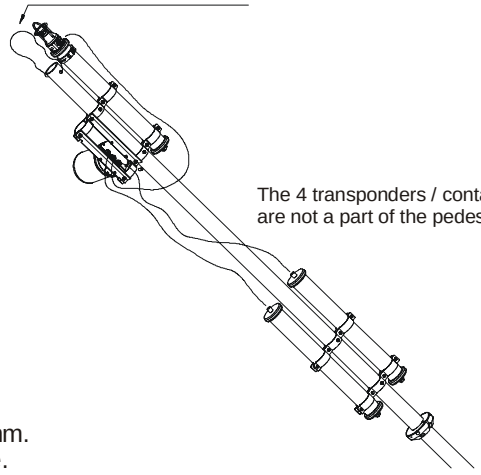
Use peg-in-hole positioning bolts on
the collar as shown on the collar drawings.el

* If a set of clamps is used
with one transponder “missing”,
use spacer as shown at the place
of the “missing” transponder.



Material:
Tube: GRP (Fibreglass)
Brackets/Bolts: Stainless Steel

ROV handle made from
thick and buoyant rope.



The 4 transponders / containers shown
are not a part of the pedestal.

Note:
All measurements are in mm.
The drawing is not in scale.

Page 1 of 1 (CD6983)	Transponder pedestal	**860-217997** Rev.A

SPARE PARTS

Introduction

This section lists the parts and modules defined by Kongsberg Maritime as *Line Replaceable Units (LRUs)*. The required mounting components (such as nuts, bolts, washers etc.) are identified on the diagrams, but have not been allocated order numbers as we regard these items as standard commercial parts available from retail outlets around the world.

Codes used

The following codes are used in the parts lists:

Part no. - Kongsberg Maritime's part number.

Item name -The name of the item.

Technical data - Technical specifications and any other relevant information.

Drw. ref. - Reference number of the production or illustration drawing where the item is included. If a number is given here, the drawing will be included in the manual's/document's drawing file.

Drw. pos. - The item's position number on the drawing referenced above.

No. in sys. - The quantity of the item used in the system. *Note that this information is not provided for standard components such as nuts, bolts and washers.*

Rec. spares - The quantity of the item recommended to be carried as spares onboard the vessel. *Note that this information is not provided for standard components such as nuts, bolts and washers.*

Accessories

This list includes the common accessories used for all transponder types. Since the figure position differs on the figures for these common items, the Drw. pos. is left out.

Part no.	Item name	Drw. ref.	No. in sys.
-	Technical data	Drw. pos.	Rec.spares
540-085631	O-ring	Figures	2/4
-	99,1 x 5,7	-	-
599-089318	PCB guide	Figures	1/1
599-089320	-	-	-
Depends on model	Information clamp ring	Figures	1
	w/freq.	-	-
Depends on model	Information clamp ring	Figures	1
	w/reg. no.	-	-
599-089487	Plug for ID-clamp	Figures	3
-	-	-	-
659-063787	Lubricant	-	1
-	"AQUA LUBE"	N/A	1
659-063787	Bag of desiccant 10 g	-	1
-	Blaugel - 10/0801	N/A	1
599-089549	Guiding collar upper	N/A	-
599-089550	Guiding collar lower	-	1
119-086872	Floating collar	N/A	-
-	1000 m	-	1
857-160820	SPT and MPT 31x series Instruction manual	N/A	1
-	(This manual)	-	-

Sensors

Part no.	Item name	Drw. ref.	No. in sys.
-	Technical data	Drw. pos.	Rec.spares
298-097540	DT sensor	N/A	-
-	-	N/A	-
298-087677	Electronic compass module	N/A	-
-	-	N/A	-
339-211580	Inclinometer	N/A	-
-	-	N/A	-

Batteries

Note *The Lithium battery is specified for each transponder.*

Part no.	Item name	Drw. ref.	No. in sys.
-	Technical data	Drw. pos.	Rec.spares
290-216804	Alkaline battery	N/A	-
-	A10/36 (24/24)	N/A	-
290-212364	Rechargeable battery	N/A	-
-	N10/36 (18/30)	N/A	-

Extractor tool

Part no.	Item name	Drw. ref.	No. in sys.
-	Technical data	Drw. pos.	Rec.spares
709-089322	Extractor tool	N/A	-
-	-	N/A	-

SPT 314 basic transponder

Complete transponder

Part no.	Item name	Drw. ref.	No. in sys.
-	Technical data	Drw. pos.	Rec.spares
102-210452	SPT 314 Transponder complete	Figure page 95	1
-	All main modules are included	N/A	-

Main modules

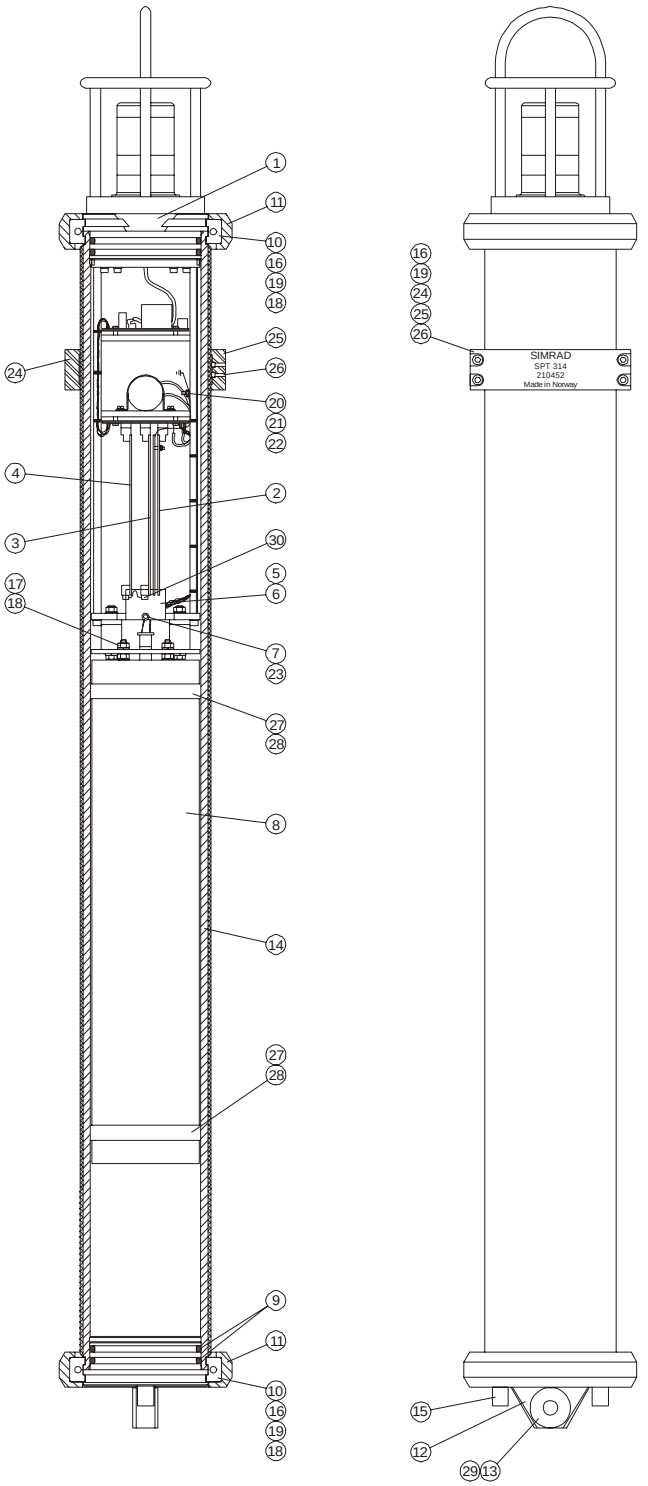
This list includes the main modules for the SPT 314 basic transponder.

Part no.	Item name	Drw. ref.	No. in sys.
-	Technical data	Drw. pos.	Rec.spares
299-210416	Electronic chassis	Figure page 95	1
-	Transducer **(1)**, Motherboard, Rxamp board and sensors (if used) are included	1	-
382-211279	Tx board	Figure page 95	1
-	-	2	-
382-083551	Microcontroller board	Figure page 95	1
-	-	3	-
382-102853	Rx board	Figure page 95	1
-	-	4	-
290-101665	Battery pack (lithium)	Figure page 95	1
-	L10/36 (18/30)	8	-
599-089263	Bottom end cap	Figure page 95	1
-	-	12	-
599-089149	Housing	Figure page 95	1
-	-	14	-

1 Separate Transducer unit, part. no: 312-210173

Accessaries

→ *Refer to the table on page 92.*



Page 1 of 1 (CD4171)	SPT 314 basic transponder - exploded view	**860-210451** Rev.D

SPT 314/R transponder

Complete transponder

Part no.	Item name	Drw. ref.	No. in sys.
-	**Technical data**	**Drw. pos.**	**Rec.spares**
102-210494	SPT 314/R Transponder complete	Figure page 97	1
-	All main modules are included	N/A	-

Main modules

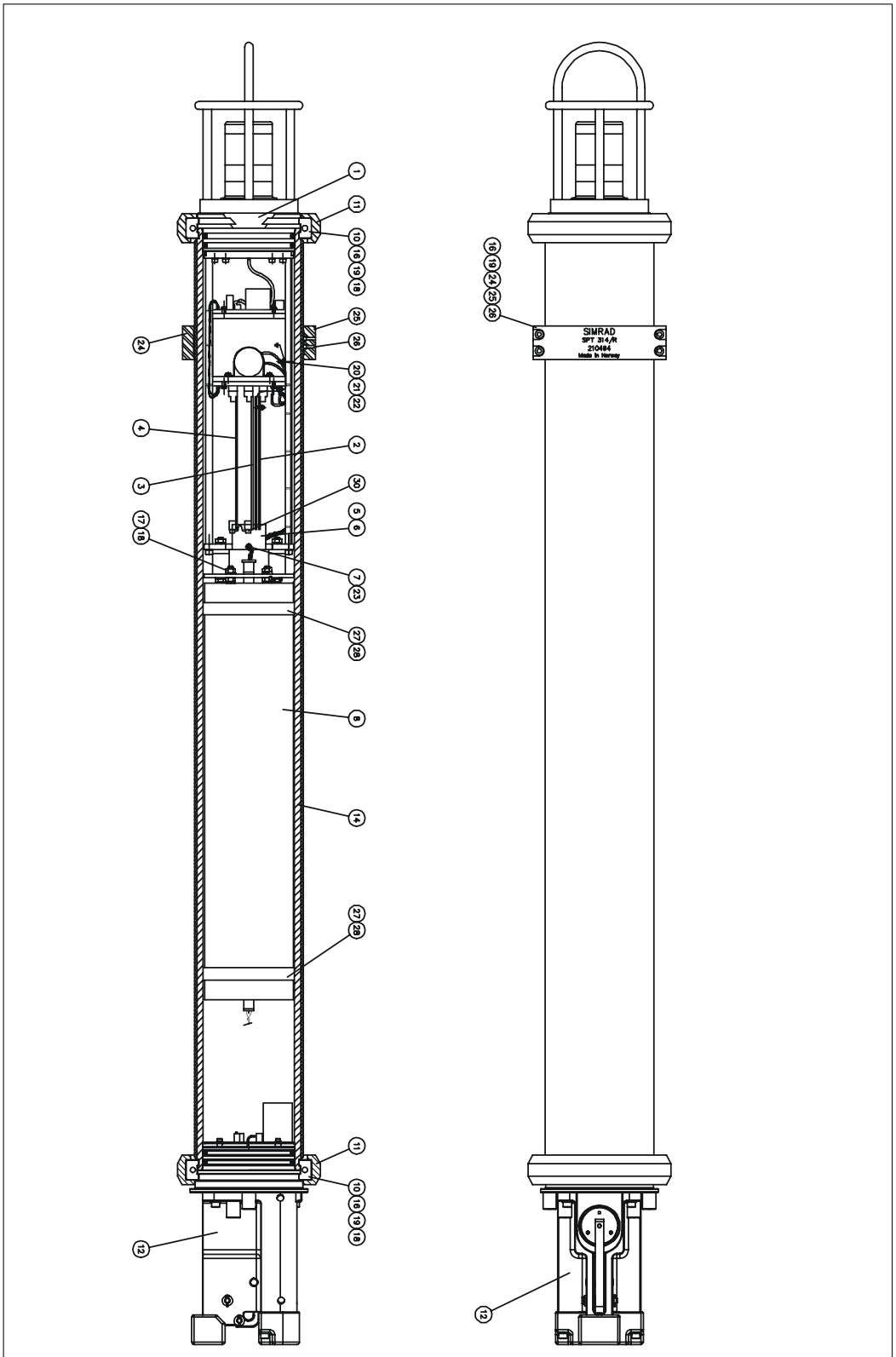
This list includes the main modules for the SPT 314/R transponder.

Part no.	Item name	Drw. ref.	No. in sys.
-	**Technical data**	**Drw. pos.**	**Rec.spares**
299-210416	Electronic chassis	Figure page 97	1
-	Transducer **(1)**, Motherboard, Rxamp board and sensors (if used) are included	1	-
382-211279	Tx board	Figure page 97	1
-	-	2	-
382-083551	Microcontroller board	Figure page 97	1
-	-	3	-
382-102853	Rx board	Figure page 97	1
-	-	4	-
290-101665	Battery pack (lithium)	Figure page 97	1
-	L10/36 (18/30)	8	-
198-085564	Release Unit	Figure page 97	1
-	-	12	-
599-089149	Housing	Figure page 97	1
-	-	14	-

1 Separate Transducer unit, part. no: 312-210173

Accessaries

→ *Refer to the table on page 92.*



Page 1 of 1 (Cd4173)	SPT 314/R transponder - exploded view	**860-210493** Rev.C

SPT 314/I transponder

Complete transponder

Part no.	Item name	Drw. ref.	No. in sys.
-	**Technical data**	**Drw. pos.**	**Rec.spares**
102-210473	SPT 314/I Transponder complete	Figure page 99	1
-	All main modules are included	N/A	-

Main modules

This list includes the main modules for the SPT 314/I transponder.

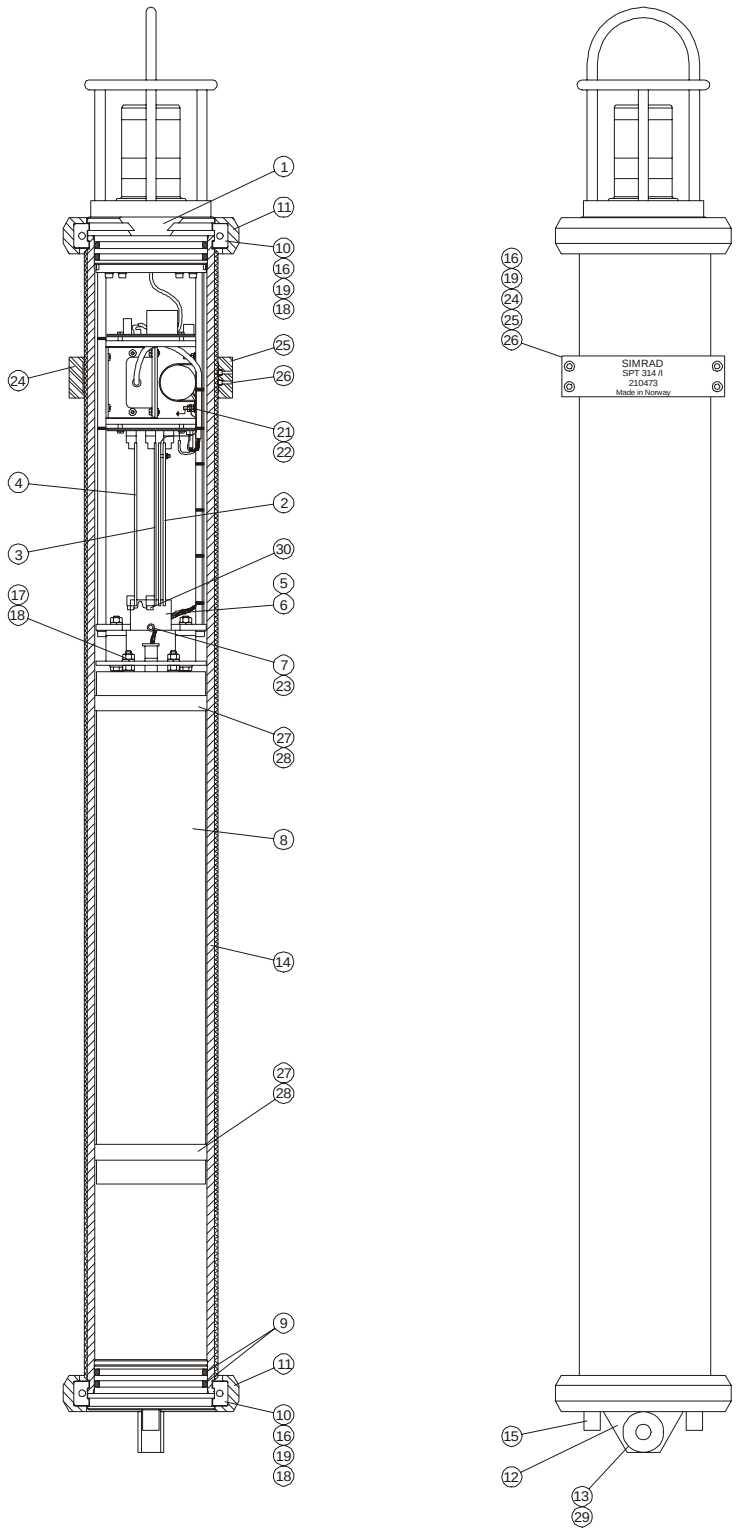
Part no.	Item name	Drw. ref.	No. in sys.
-	**Technical data**	**Drw. pos.**	**Rec.spares**
299-210471	Electronic chassis	Figure page 99	1
-	Transducer **(1)**, Motherboard, Rxamp board and sensors **(2)** (if used) are included	1	-
382-211279	Tx board	Figure page 99	1
-	-	2	-
382-083551	Microcontroller board	Figure page 99	1
-	-	3	-
382-102853	Rx board	Figure page 99	1
-	-	4	-
290-101665	Battery pack (lithium)	Figure page 99	1
-	L10/36 (18/30)	8	-
599-089263	Bottom end cap	Figure page 99	1
-	-	12	-
599-089149	Housing	Figure page 99	1
-	-	14	-

1 Separate Transducer unit, part. no: 312-210173

2 Separate Inclinometer, refer to page 93.

Accessaries

→ *Refer to the table on page 92.*



Page 1 of 1 (CD4172)	SPT 314/I transponder - exploded view	**860-210472** Rev.D

SPT 319 basic transponder

Complete transponder

Part no.	Item name	Drw. ref.	No. in sys.
-	Technical data	Drw. pos.	Rec.spares
102-103059	SPT 319 Transponder complete	Figure page 101	1
-	All main modules are included	N/A	-

Main modules

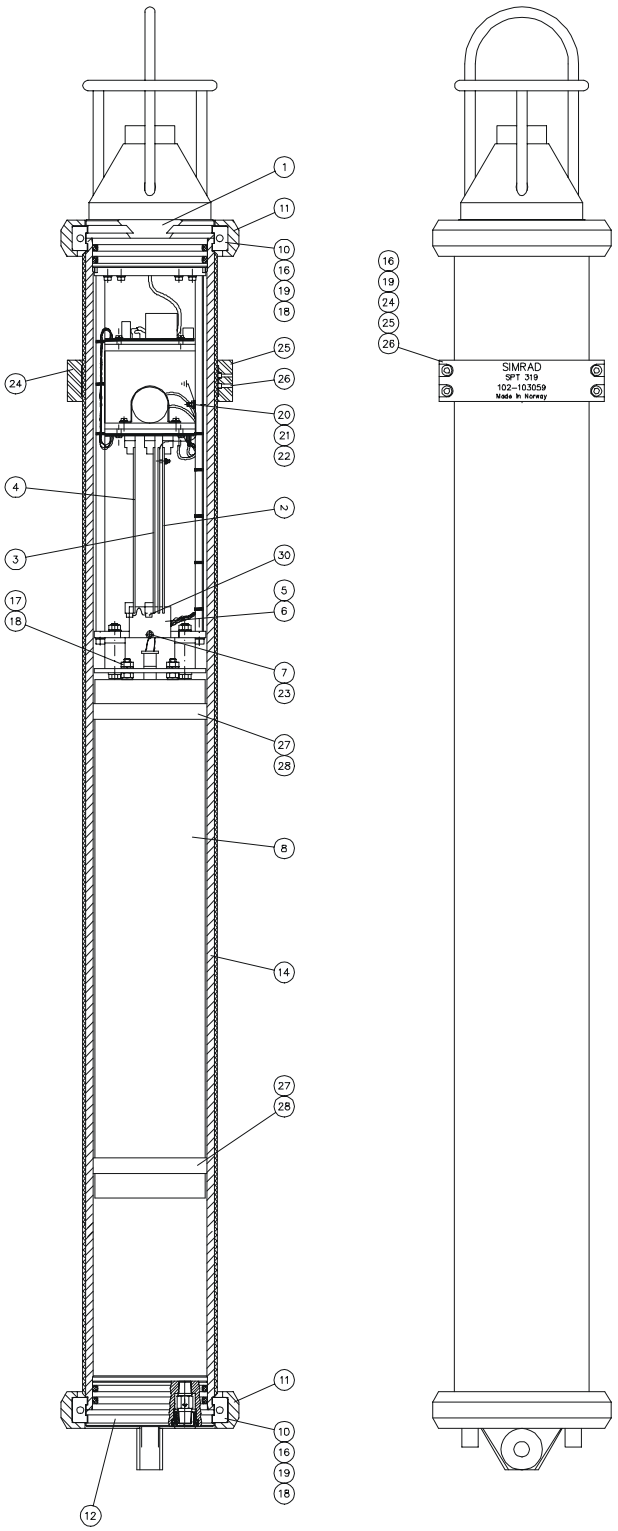
This list includes the main modules for the SPT 319 basic transponder.

Part no.	Item name	Drw. ref.	No. in sys.
-	Technical data	Drw. pos.	Rec.spares
299-089330	Electronic chassis	Figure page 101	1
-	Transducer **(1)**, Motherboard, Rxamp board and sensors (if used) are included	1	-
382-083607	Tx board	Figure page 101	1
-	-	2	-
382-083551	Microcontroller board	Figure page 101	1
-	-	3	-
382-083602	Rx board	Figure page 101	1
-	-	4	-
290-101665	Battery pack (lithium)	Figure page 101	1
-	L10/36 (18/30)	8	-
599-089263	Bottom end cap	Figure page 101	1
-	-	12	-
599-089149	Housing	Figure page 101	1
-	-	14	-

1 Separate Transducer unit, part. no: 312-073871

Accessaries

→ *Refer to the table on page 92.*



Page 1 of 1 (CD4169)	SPT 319 basic transponder - exploded view	**102-103059** Rev.F

SPT 319/R transponder

Complete transponder

Part no.	Item name	Drw. ref.	No. in sys.
-	Technical data	Drw. pos.	Rec.spares
102-103060	SPT 319/R Transponder complete	Figure page 103	1
-	All main modules are included	N/A	-

Main modules

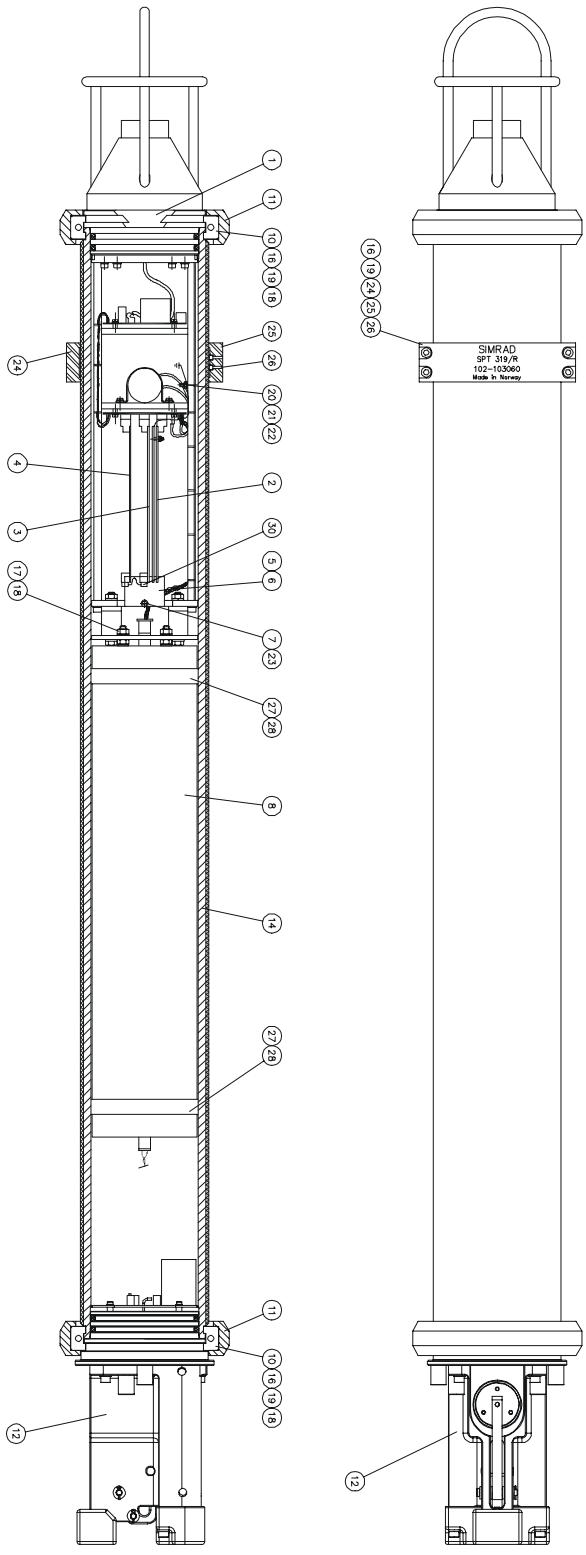
This list includes the main modules for the SPT 319/R transponder.

Part no.	Item name	Drw. ref.	No. in sys.
	Technical data	Drw. pos.	Rec.spares
299-089330	Electronic chassis	Figure page 103	1
-	Transducer **(1)**, Motherboard, Rxamp board and sensors (if used) are included	1	-
382-083607	Tx board	Figure page 103	1
-	-	2	-
382-083551	Microcontroller board	Figure page 103	1
-	-	3	-
382-083602	Rx board	Figure page 103	1
-	-	4	-
290-101665	Battery pack (lithium)	Figure page 103	1
-	L10/36 (18/30)	8	-
599-089149	Housing	Figure page 103	1
-	-	14	-
198-085564	Release unit	Figure page 103	1
-	-	12	-

1 Separate Transducer unit, part. no: 312-073871

Accessaries

→ *Refer to the table on page 92.*



Page 1 of 1 (CD4170)	SPT 319/R transponder - exploded view	**102-103060** Rev.D

SPT 319/H transponder

Complete transponder

Part no.	Item name	Drw. ref.	No. in sys.
-	**Technical data**	**Drw. pos.**	**Rec.spares**
860-211878	SPT 319/Ht Transponder complete	Figure page 105	1
-	All main modules are included	N/A	-

Main modules

This list includes the main modules for the SPT 319/H transponder.

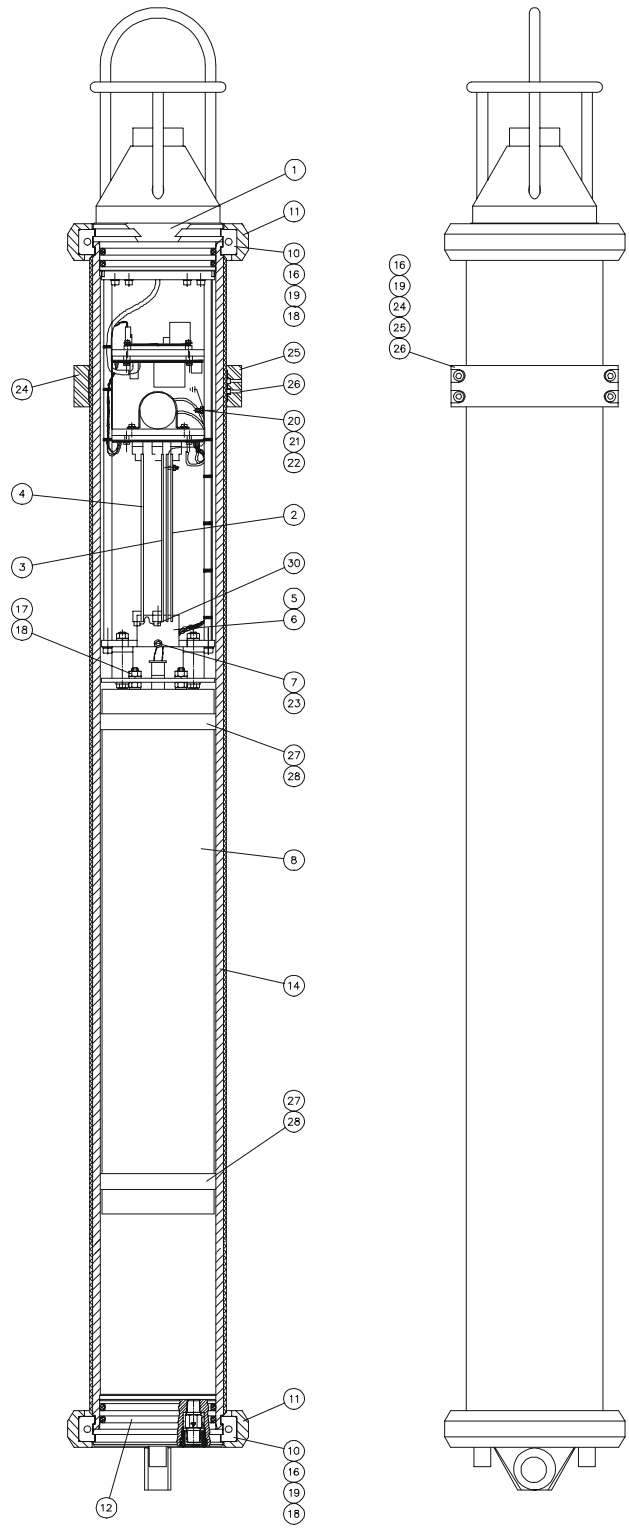
Part no.	Item name	Drw. ref.	No. in sys.
-	**Technical data**	**Drw. pos.**	**Rec.spares**
299-089523	Electronic chassis	Figure page 105	1
-	Transducer **(1)**, Motherboard, Rxamp board and sensors **(2)** (if used) are included	-	-
382-083607	Tx board	Figure page 105	1
-	-	2	-
382-083551	Microcontroller board	Figure page 105	1
-	-	3	-
382-083602	Rx board	Figure page 105	1
-	-	4	-
290-101665	Battery pack (lithium)	Figure page 105	1
-	L10/36 (18/30)	8	-
599-212422	Housing	Figure page 105	1
-	-		-

1 Separate Transducer unit, part. no: 312-073871

2 Separate Electronic compass module, see section on page 93.

Accessaries

→ *Refer to the table on page 92.*



Page 1 of 1 (CD4498)	SPT 319/H transponder - exploded view	**860-211879** Rev.C

SPT 319/I-St transponder

Note *The standard SPT 319/I transponder is delivered with aluminium housing.Rrefer to page 108.*

Complete transponder

Part no.	Item name	Drw. ref.	No. in sys.
	Technical data	**Drw. pos.**	**Rec.spares**
102-211515	SPT 319/I-St Transponder complete	Figure page 107	1
-	All main modules are included	N/A	-

Main modules

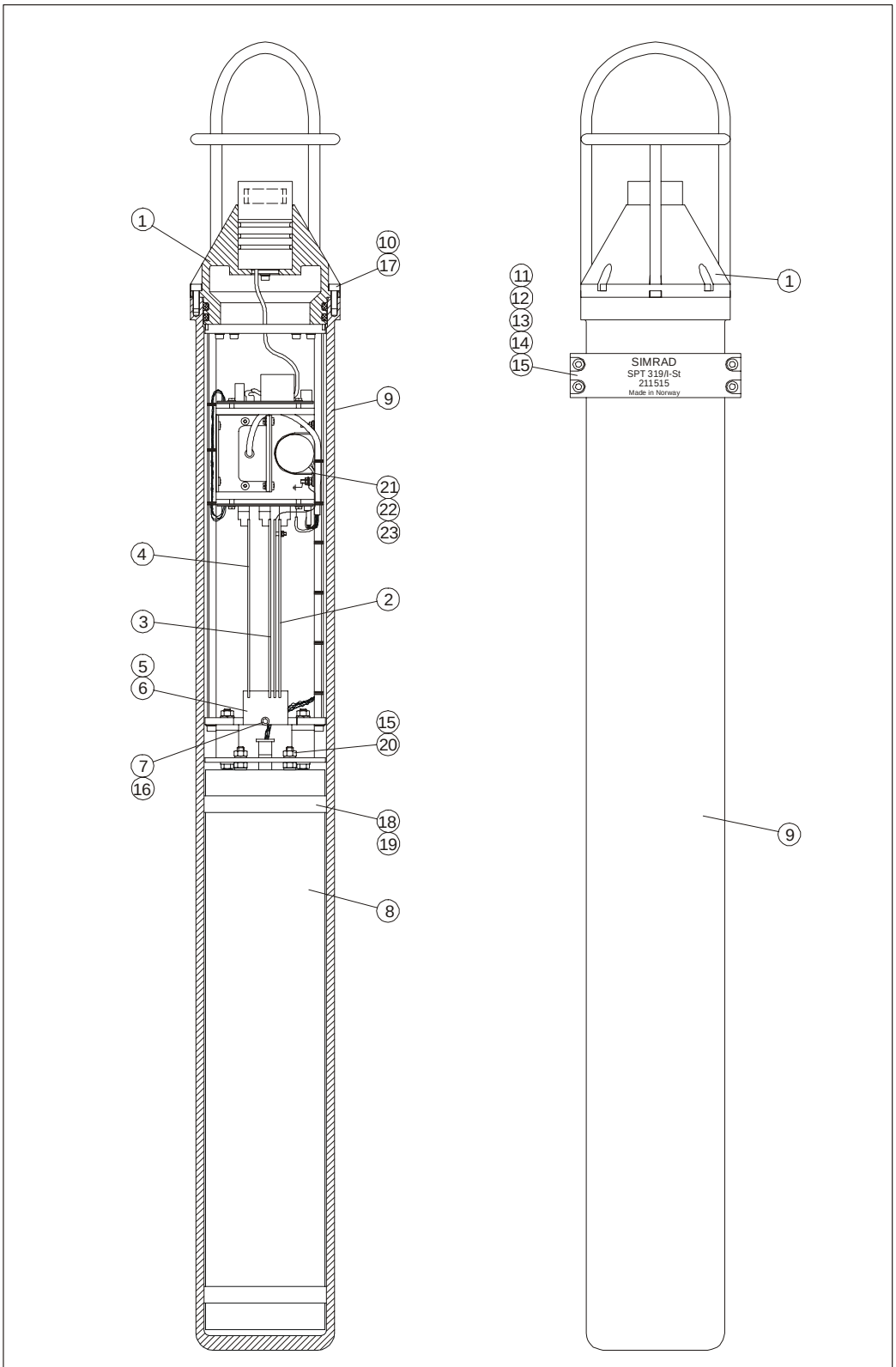
This list includes the main modules for the SPT 319/I-St stainless steel transponder.

Part no.	Item name	Drw. ref.	No. in sys.
-	**Technical data**	**Drw. pos.**	**Rec.spares**
312-089504	SPT 319/I-St transducer	Figure page 107	1
-	-	1	-
299-089523	Electronic chassis	Figure page 107	1
-	Motherboard, Rxamp board and sensors **(1)** (if used) are included	1	-
382-083607	Tx board	Figure page 107	1
-	-	2	-
382-083551	Microcontroller board	Figure page 107	1
-	-	3	-
382-083602	Rx board	Figure page 107	1
-	-	4	-
290-101665	Battery pack (lithium)	Figure page 107	1
-	L10/36 (18/30)	8	-
599-089506	Housing	Figure page 107	1
-	-	9	-

1 Separate Inclinometer, refer to page 93.

Accessaries

→ *Refer to the table on page 92.*



Page 1 of 1 (CD6004)	SPT 139/I-St transponder - exploded view	**860-211516** Rev.A

SPT 319/I transponder

Note *The SPT 319/I transponder can also be delivered with stainless steel housing. Refer to page 106.*

Complete transponder

Part no.	Item name	Drw. ref.	No. in sys.
-	Technical data	Drw. pos.	Rec.spares
102-215558	SPT 319/I Transponder complete	Figure page 109	1
-	All main modules are included	N/A	-

Main modules

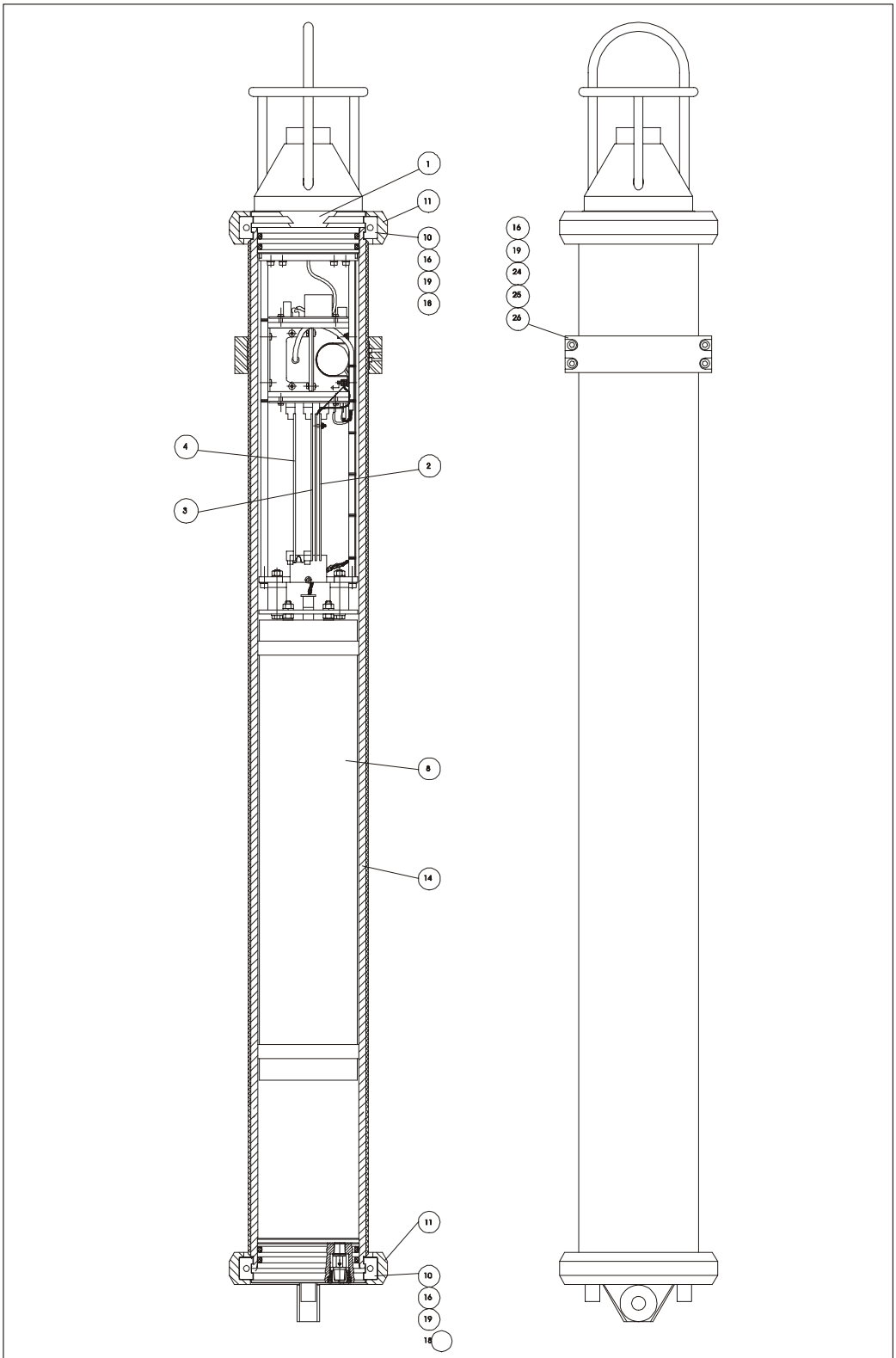
This list includes the main modules for the SPT 319/I aluminium transponder.

Part no.	Item name	Drw. ref.	No. in sys.
-	Technical data	Drw. pos.	Rec.spares
312-073871	SPT 319/I-transducer	Figure page 109	1
-	-	1	-
299-089452	Electronic chassis	Figure page 109	1
-	Transducer **(1)**, Motherboard, Rxamp board and sensors **(2)** (if used) are included	1	-
382-083607	Tx board	Figure page 109	1
-	-	2	-
382-083551	Microcontroller board	Figure page 109	1
-	-	3	-
382-083602	Rx board	Figure page 109	1
-	-	4	-
290-101665	Battery pack (lithium)	Figure page 109	1
-	L10/36 (18/30)	8	-
599-089149	Housing	Figure page 109	1
-	-	14	-

2 Separate Inclinometer, refer to page 93.

Accessaries

→ *Refer to the table on page 92.*



Page 1 of 1 (Cd6543)	Spt 319/I transponder - exploded view	**860-215559** Rev.B

SPT 319/S transponder

Complete transponder

Part no.	Item name	Drw. ref.	No. in sys.
	Technical data	**Drw. pos.**	**Rec.spares**
102-220107	SPT 319/S Transponder complete	Figure page 111	1
-	All main modules are included	N/A	-

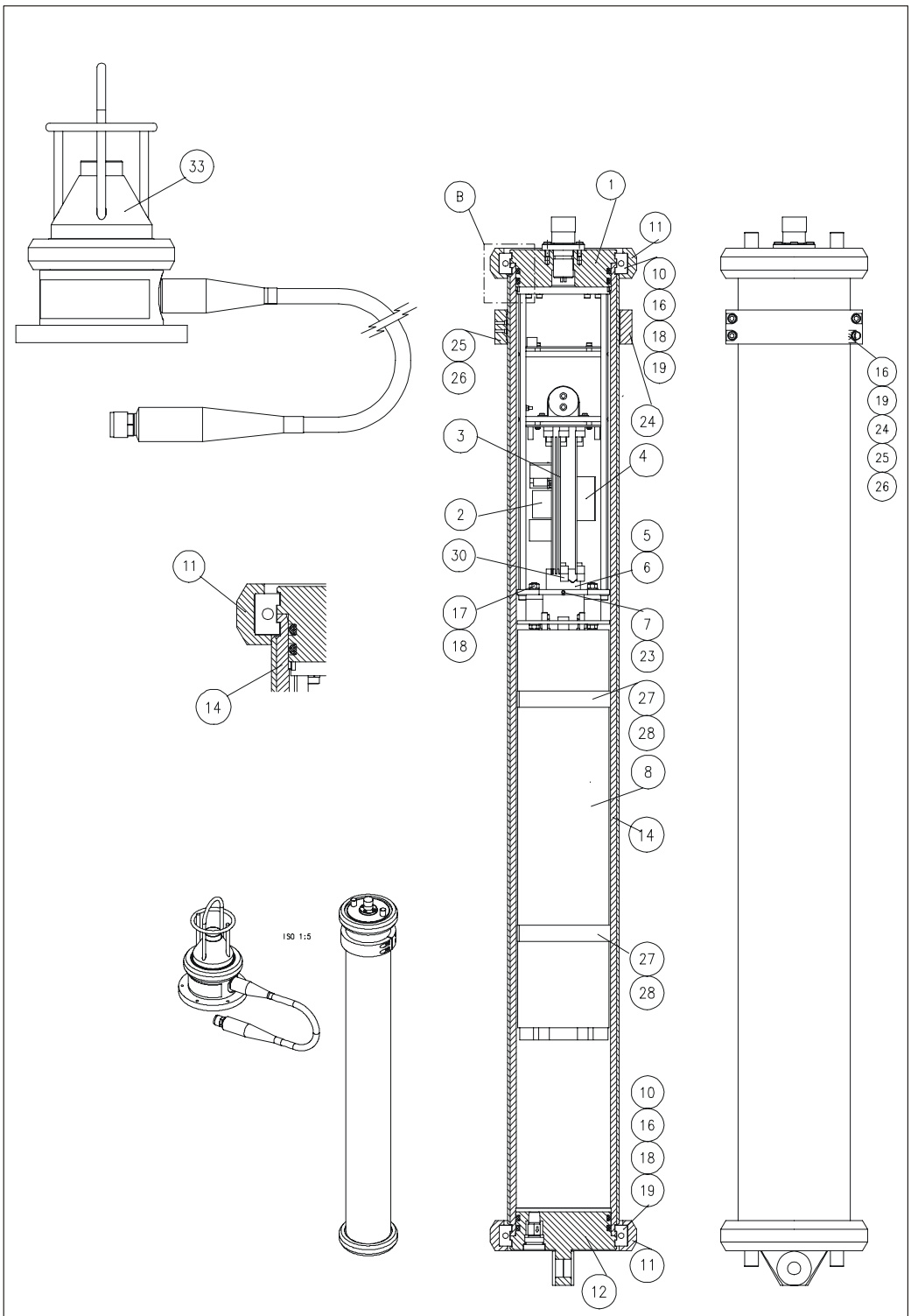
Main modules

This list includes the main modules for the SPT 319/S aluminium transponder.

Part no.	Item name	Drw. ref.	No. in sys.
-	**Technical data**	**Drw. pos.**	**Rec.spares**
100-219687	Split TD 319 Transducer	Figure page 111	1
-	-	-	-
299-220153	Electronic chassis	Figure page 111	1
-	Motherboard, Rxamp board and sensors (if used) are included	1	-
382-083607	Tx board	Figure page 111	1
-	-	2	-
382-083551	Microcontroller board	Figure page 111	1
-	-	3	-
382-083602	Rx board	Figure page 111	1
-	-	4	-
290-101665	Battery pack (lithium)	Figure page 111	1
-	L10/36 (18/30)	8	-
499-212015	Bottom end cap	Figure page 111	1
-	-	10	-
599-089149	Housing	Figure page 111	1
-	-	14	-

Accessaries

→ *Refer to the table on page 92.*



Page 1 of 1 (Cd30035)	SPT 319/S transponder - exploded view	**102-220107** Rev.A

MPT 313 basic transponder

Complete transponder

Part no.	Item name	Drw. ref.	No. in sys.
-	Technical data	Drw. pos.	Rec.spares
102-215587	MPT 313 Transponder complete	Figure page 113	1
-	All main modules are included	N/A	-

Main modules

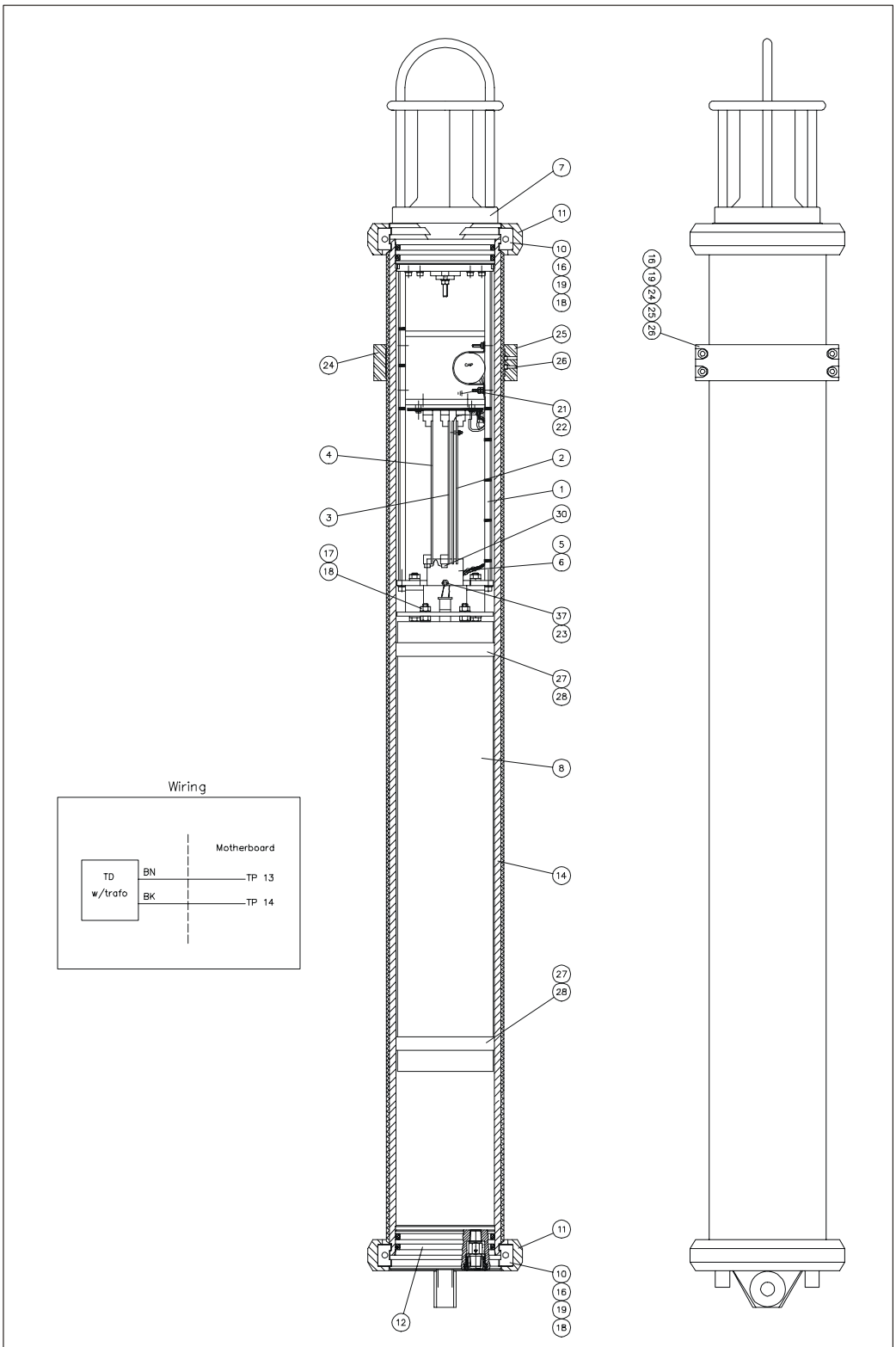
This list includes the main modules for the MPT 313 basic transponder.

Part no.	Item name	Drw. ref.	No. in sys.
-	Technical data	Drw. pos.	Rec.spares
312-215300	MPT 313 transducer	Figure page 113	1
-	-	7	-
299-215585	Electronic chassis	Figure page 113	1
-	Motherboard and sensors (if used) are included	1	-
382-211279	Tx board	Figure page 113	1
-	-	2	-
382-083551	Microcontroller board	Figure page 113	1
-	-	3	-
382-102853	Rx board	Figure page 113	1
-	-	4	-
290-101665	Battery pack (lithium)	Figure page 113	1
-	L10/36 (18/30)	8	-
499-212015	Bottom end cap	Figure page 113	1
-	-	12	-
599-089149	Housing	Figure page 113	1
-	-	14	-
540-086758	O-ring/ TD head	Figure page 113	2/4
-	59.5 x 3.0	-	-
540-033009	O-ring/ TD head	Figure page 113	2/4
-	70.0 x 3.0	-	-
549-086759	Backup ring/ TD head	Figure page 113	2/4
-	59.5 x 3.0	-	-

1 Separate Transducer unit, part. no: 312-210173

Accessaries

→ *Refer to the table on page 92.*



Page 1 of 1 (CD6060)	MPT 313 basic transponder - exploded view	**860-215588** Rev.B

MPT 313/H transponder

Complete transponder

Part no.	Item name	Drw. ref.	No. in sys.
-	Technical data	Drw. pos.	Rec.spares
102-215589	MPT 313/H Transponder complete	Figure page 115	1
-	All main modules are included	N/A	-

Main modules

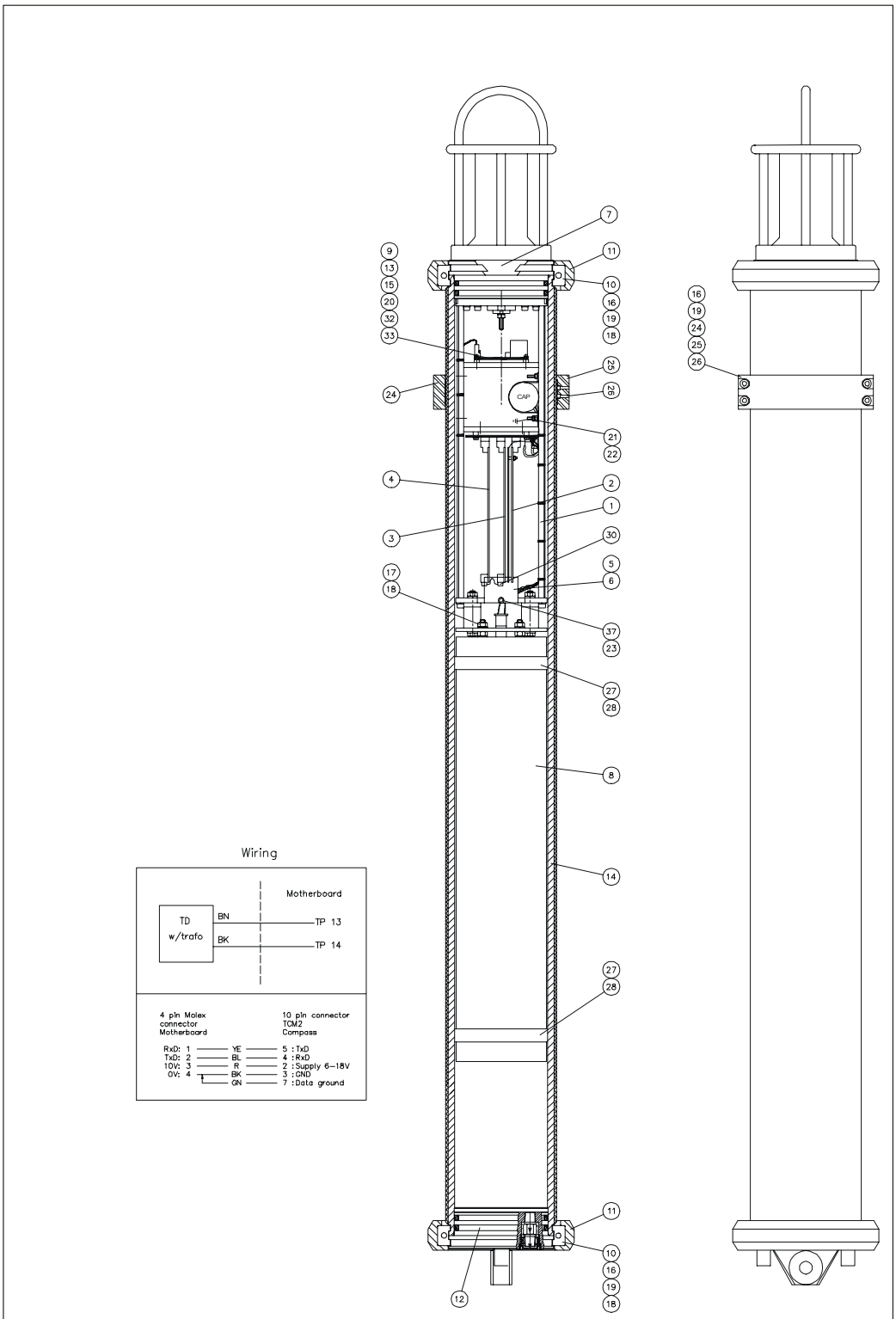
This list includes the main modules for the MPT 313/H transponder.

Part no.	Item name	Drw. ref.	No. in sys.
-	Technical data	Drw. pos.	Rec.spares
312-215300	MPT 313 transducer	Figure page 115	1
-	-	7	-
299-215585	Electronic chassis	Figure page 115	1
-	Motherboard and sensors **(1)** (if used) are included	1	-
382-211279	Tx board	Figure page 115	1
-	-	2	-
382-083551	Microcontroller board	Figure page 115	1
-	-	3	-
382-102853	Rx board	Figure page 115	1
-	-	4	-
290-101665	Battery pack (lithium)	Figure page 115	1
-	L10/36 (18/30)	8	-
499-212015	Bottom end cap	Figure page 115	1
-	-	12	-
599-089149	Housing	Figure page 115	1
-	-	14	-
540-086758	O-ring/ TD head	Figure page 115	2/4
-	59.5 x 3.0	-	-
540-033009	O-ring/ TD head	Figure page 115	2/4
-	70.0 x 3.0	-	-
549-086759	Backup ring/ TD head	Figure page 115	2/4
-	59.5 x 3.0	-	-

1 Compass sensor, refer to page 93.

Accessaries

→ *Refer to the table on page 92.*



Page 1 of 1 (CD6061)	MPT 313/H transponder - exploded view	**860-215590** Rev.C

MPT 313/S transponder

Complete transponder

Part no.	Item name	Drw. ref.	No. in sys.
-	Technical data	Drw. pos.	Rec.spares
102-217304	MPT 313/S Transponder complete	Figure page 117	1
-	All main modules are included	N/A	-

MPT 313/RS transponder

Complete transponder

Part no.	Item name	Drw. ref.	No. in sys.
-	Technical data	Drw. pos.	Rec.spares
102-217305	MPT 313/RS Transponder complete	Figure page 117	1
-	All main modules are included	N/A	-

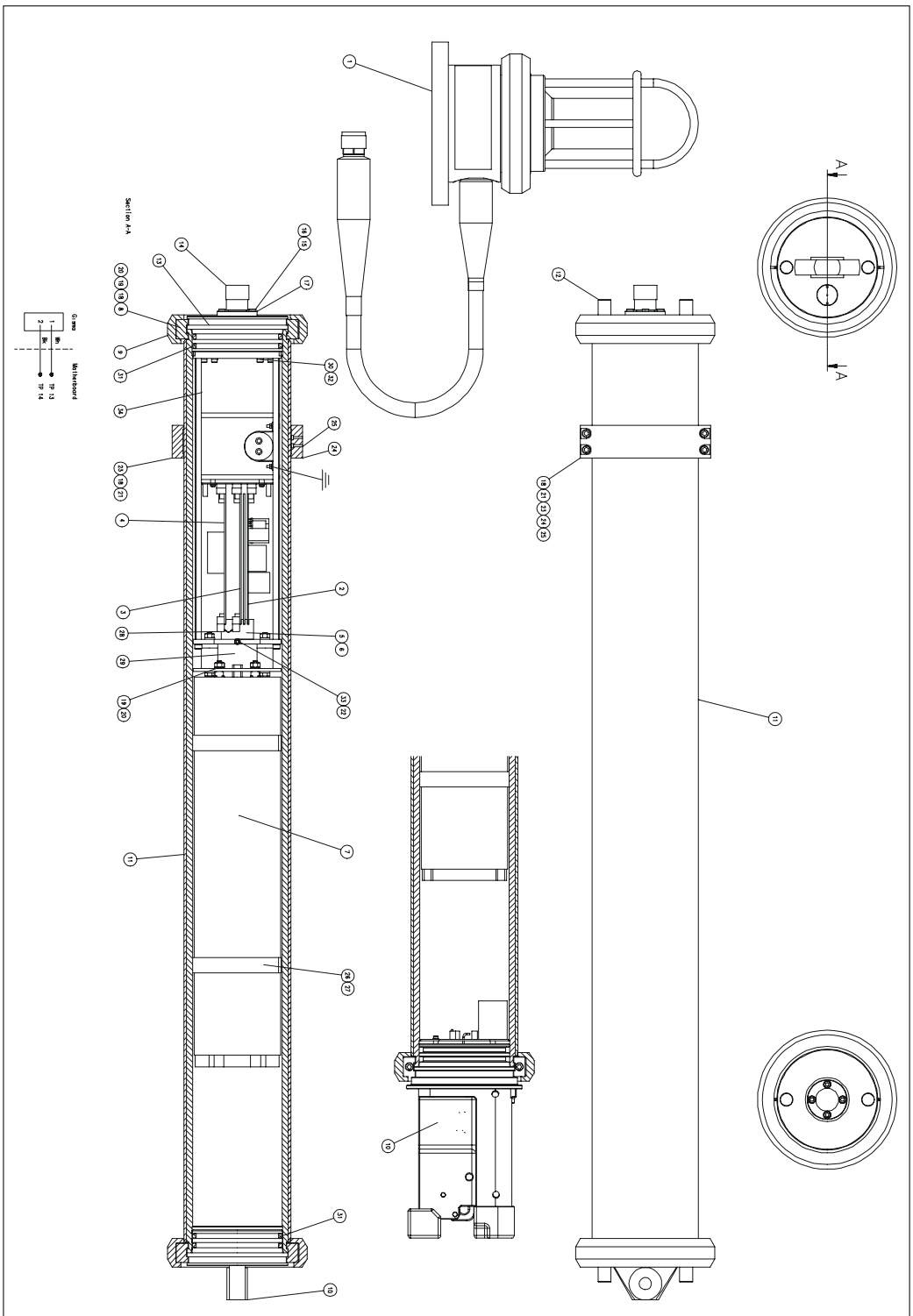
Main modules

This list includes the main modules for both the MPT 313/S and the MPT 313/RS aluminium transponders.

Part no.	Item name	Drw. ref.	No. in sys.
-	Technical data	Drw. pos.	Rec.spares
100-217308	Split TD 313 Transducer	Figure page 117	1
-	4 pins	1	-
382-083607	Tx board	Figure page 117	1
-	-	2	-
382-083551	Microcontroller board	Figure page 117	1
-	-	3	-
382-102853	Rx board	Figure page 117	1
-	-	4	-
290-101665	Battery pack (lithium)	Figure page 117	1
-	L10/36 (18/30)	7	-
599-089149	Housing	Figure page 117	1
-	-	11	-
499-212015	Bottom end cap for MST 313/S	Figure page 117	1
-	-	10	-
189-085564	Release unit for MST 313/SR	Figure page 117	1
-	-	10	-

Accessories

→ *Refer to the table on page 92.*



Page 1 of 1 (CD6903)	MPT 313/S and MPT 313/RS transponders - exploded view	**860-217306** Rev.B

Magnetic release mechanism

Complete unit

Part no.	Item name	Drw. ref.	No. in sys.
-	Technical data	Drw. pos.	Rec.spares
499-215018	Release unit complete	Figure page 118	1
-	-	N/A	-

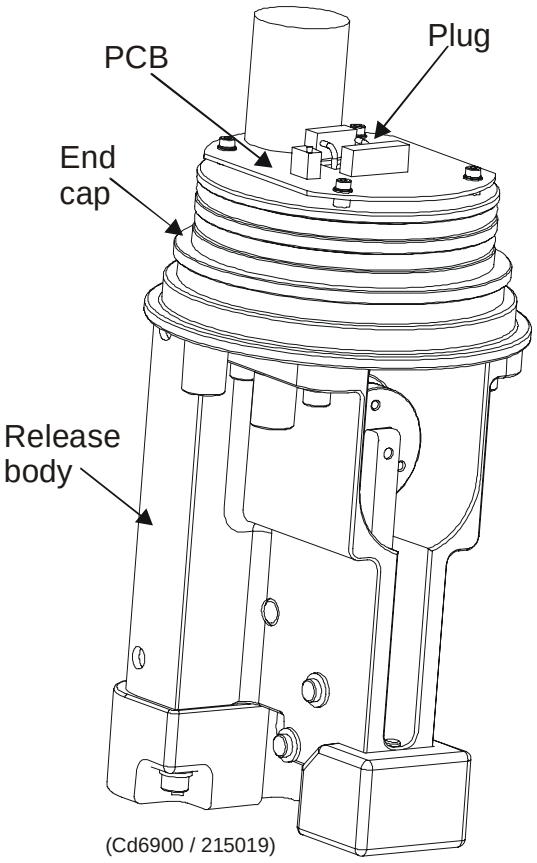


Figure 41 Magnetic release mechanism

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MPT 319 basic transponder

Complete transponder

Part no.	Item name	Drw. ref.	No. in sys.
-	Technical data	Drw. pos.	Rec.spares
102-089315	MPT 319 Transponder complete	Figure page 121	1
-	All main modules are included	N/A	-

Main modules

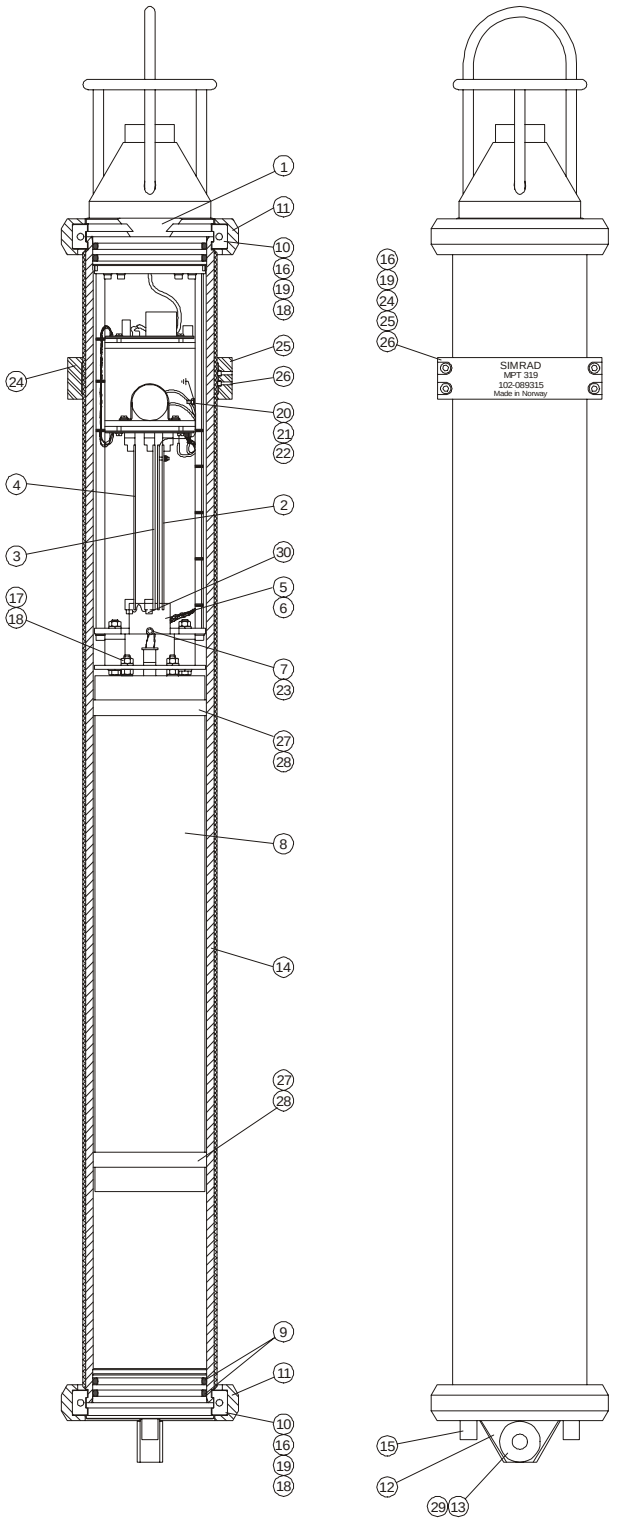
This list includes the main modules for the MPT 319 basic transponder.

Part no.	Item name	Drw. ref.	No. in sys.
-	Technical data	Drw. pos.	Rec.spares
299-089330	Electronic chassis	Figure page 121	1
-	Transducer **(1)**, Motherboard, Rxamp board and sensors (if used) are included	1	-
382-083607	Tx board	Figure page 121	1
-	-	2	-
382-083551	Microcontroller board	Figure page 121	1
-	-	3	-
382-083602	Rx board	Figure page 121	1
-	-	4	-
290-101665	Battery pack (lithium)	Figure page 121	1
-	L10/36 (18/30)	8	-
599-089263	Bottom end cap	Figure page 121	1
-	-	12	-
599-089149	Housing	Figure page 121	1
-	-	14	-

1 Separate Transducer unit, part. no: 312-073871

Accessaries

→ *Refer to the table on page 92.*



Page 1 of 1 (CD4164)	MPT 319 basic transponder - exploded view	**102-089315** Rev.F

MPT 319/DT transponder

Note *The MPT 319/DT transponder can also be delivered with stainless steel housing. Refer to page 128.*

Complete transponder

Part no.	Item name	Drw. ref.	No. in sys.
-	Technical data	Drw. pos.	Rec.spares
102-089431	MPT 319/DT Transponder complete	Figure page 123	1
-	All main modules are included	N/A	-

Main modules

This list includes the main modules for the MPT 319/DT aluminium transponder.

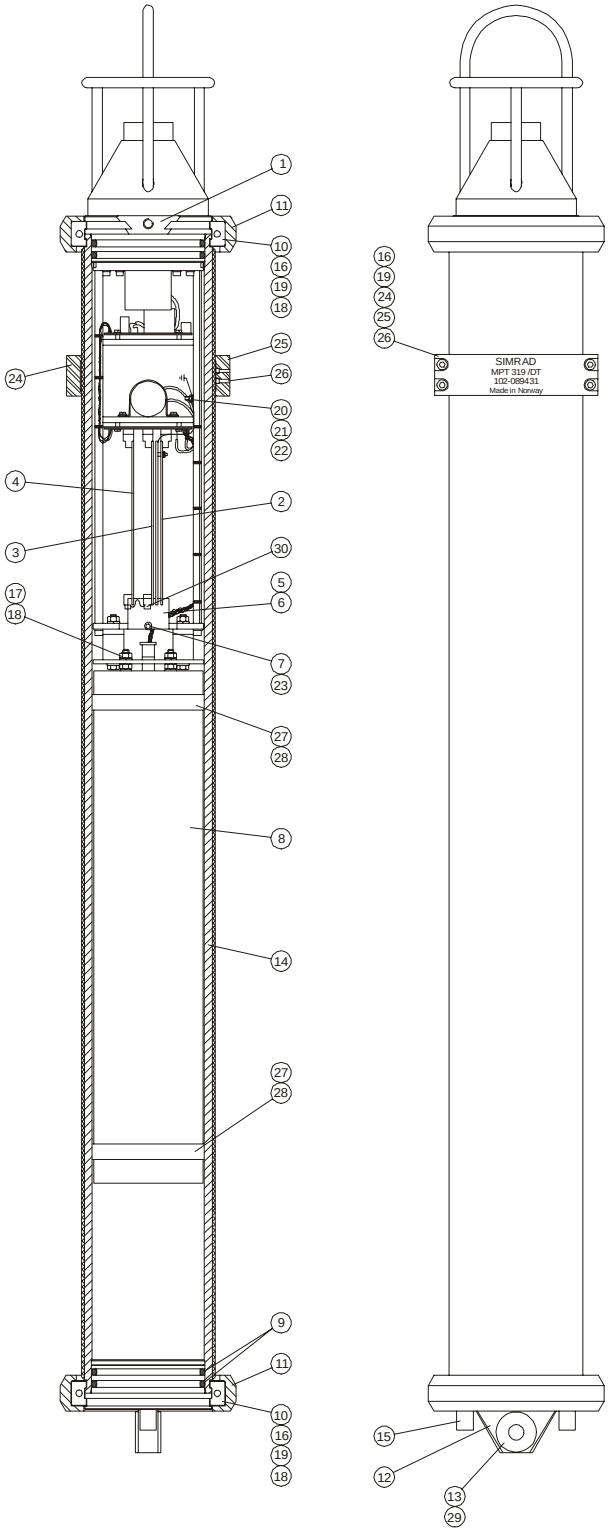
Part no.	Item name	Drw. ref.	No. in sys.
-	Technical data	Drw. pos.	Rec.spares
299-089183	Electronic chassis	Figure page 123	1
-	Transducer **(1)**, Motherboard, Rxamp board and sensors **(2)** (if used) are included	1	-
382-083607	Tx board	Figure page 123	1
-	-	2	-
382-083551	Microcontroller board	Figure page 123	1
-	-	3	-
382-083602	Rx board	Figure page 123	1
-	-	4	-
290-101665	Battery pack (lithium)	Figure page 123	1
-	L10/36 (18/30)	8	-
599-089263	Bottom end cap	Figure page 123	1
-	-	12	-
599-089149	Housing	Figure page 123	1
-	-	14	-

1 Separate Transducer unit, part. no: 312-073871

2 Separate DT sensor, refer to page 93.

Accessaries

→ *Refer to the table on page 92.*



Page 1 of 1 (CD4162)	MPT 319/DT transponder - exploded view	**102-089431** Rev.E

MPT 319/R transponder

Complete transponder

Part no.	Item name	Drw. ref.	No. in sys.
-	Technical data	Drw. pos.	Rec.spares
102-089419	MPT 319/R Transponder complete	Figure page 125	1
-	All main modules are included	N/A	-

Main modules

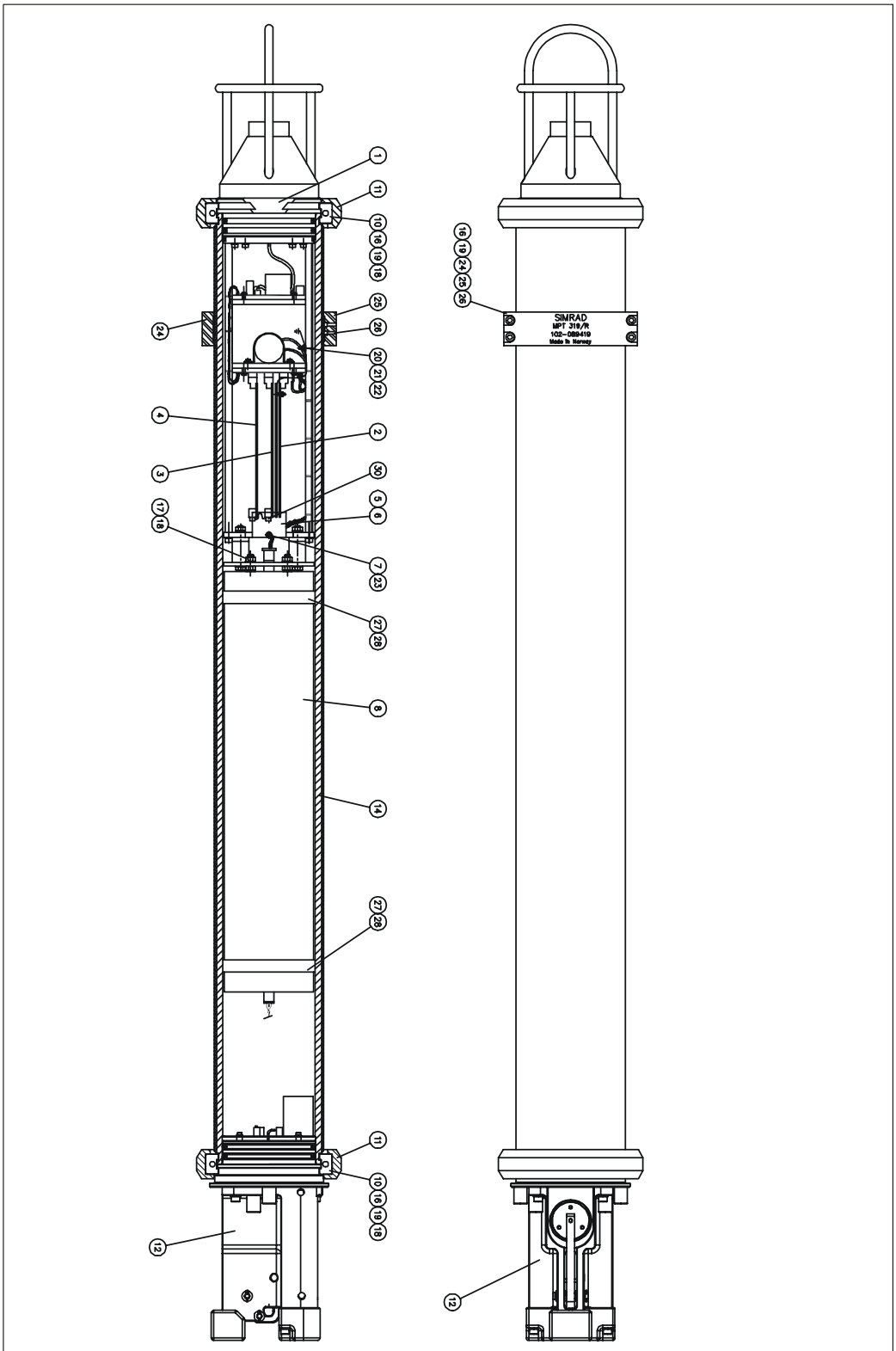
This list includes the main modules for the MPT 319/R transponder.

Part no.	Item name	Drw. ref.	No. in sys.
-	Technical data	Drw. pos.	Rec.spares
299-089330	Electronic chassis	Figure page 125	1
-	Transducer **(1)**, Motherboard, Rxamp board and sensors (if used) are included	1	-
382-083607	Tx board	Figure page 125	1
-	-	2	-
382-083551	Microcontroller board	Figure page 125	1
-	-	3	-
382-083602	Rx board	Figure page 125	1
-	-	4	-
290-101665	Battery pack (lithium)	Figure page 125	1
-	L10/36 (18/30)	8	-
198-085564	Release unit	Figure page 125	1
-	-	12	-
599-089149	Housing	Figure page 125	1
-	-	14	-

1 Separate Transducer unit, part. no: 312-073871

Accessaries

→ *Refer to the table on page 92.*



Page 1 of 1 (CD4163)	MPT 319/R transponder - exploded view	**102-089419** Rev.C

MPT 319/DTR transponder

Complete transponder

Part no.	Item name	Drw. ref.	No. in sys.
-	**Technical data**	**Drw. pos.**	**Rec.spares**
102-089319	MPT 319/DTR Transponder complete	Figure page 127	1
-	All main modules are included	N/A	-

Main modules

This list includes the main modules for the MPT 319/DTR transponder.

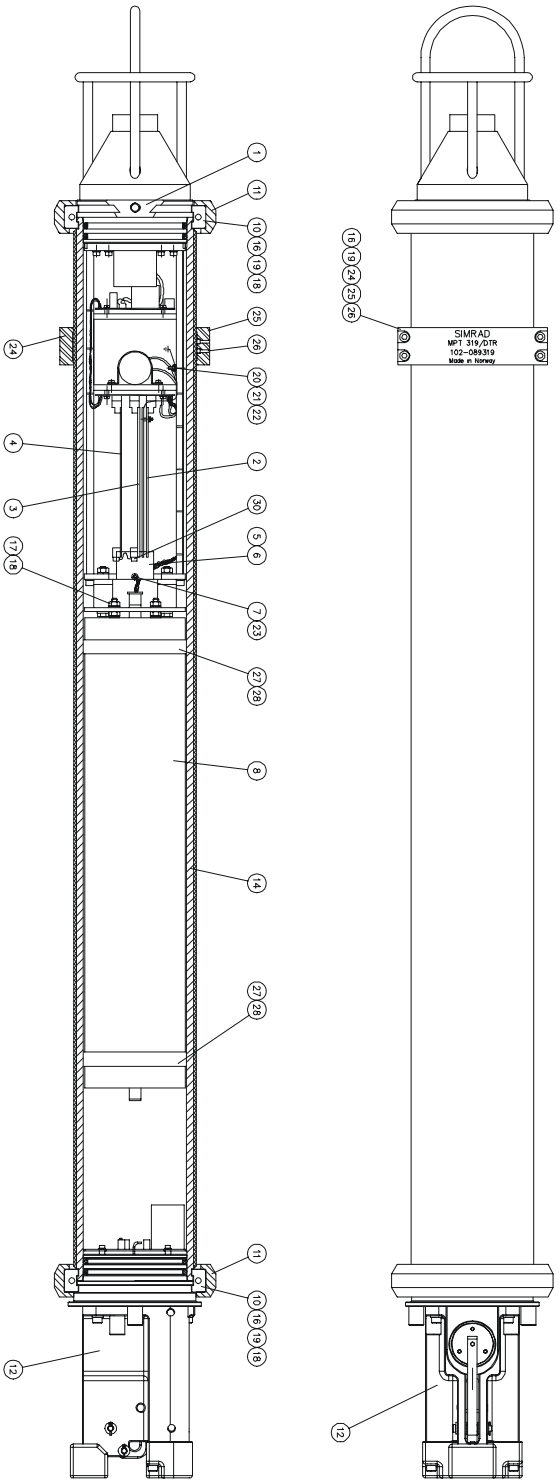
Part no.	Item name	Drw. ref.	No. in sys.
-	**Technical data**	**Drw. pos.**	**Rec.spares**
299-089183	Electronic chassis	Figure page 127	1
-	Transducer **(1)**, Motherboard, Rxamp board and sensors **(2)** (if used) are included	1	-
382-083607	Tx board	Figure page 127	1
-	-	2	-
382-083551	Microcontroller board	Figure page 127	1
-	-	3	-
382-083602	Rx board	Figure page 127	1
-	-	4	-
290-101665	Battery pack (lithium)	Figure page 127	1
-	L10/36 (18/30)	8	-
198-085564	Release unit	Figure page 127	1
-	-	12	-
599-089149	Housing	Figure page 127	1
-	-	14	-

1 Separate Transducer unit, part. no: 312-073871

2 Separate DT sensor, refer to page 93.

Accessaries

→ *Refer to the table on page 92.*



Page 1 of 1 (CD4161)	MPT 319/DTR transponder - exploded view	**102-089319** Rev.C

MPT 319/DT-St transponder

Note *The standard MPT 319/DT transponder is delivered with aluminium housing. Refer to page 122.*

Complete transponder

Part no.	Item name	Drw. ref.	No. in sys.
-	Technical data	Drw. pos.	Rec.spares
102-089498	MPT 319/DT-St Transponder complete	Figure page 129	1
-	All main modules are included	N/A	-

Main modules

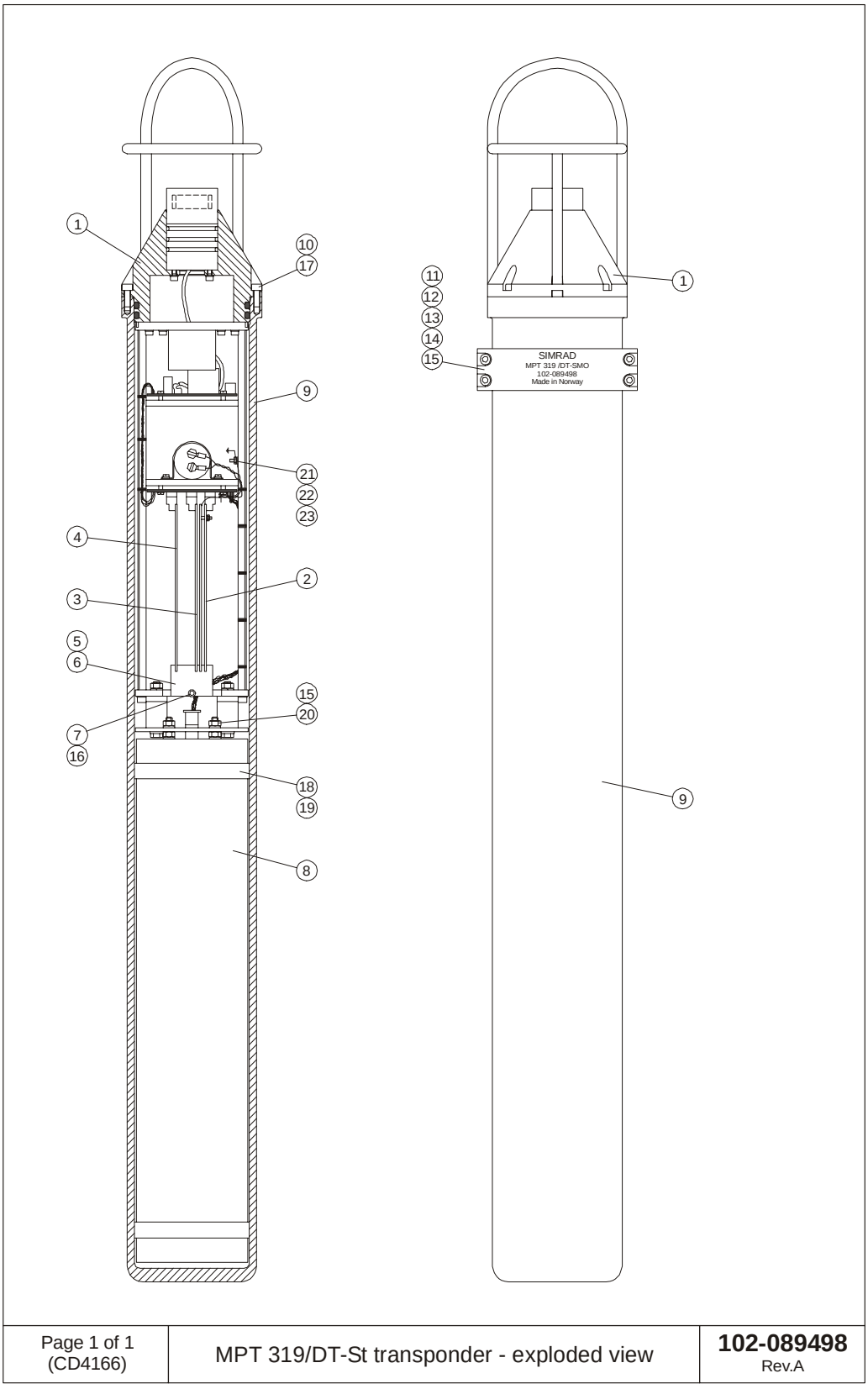
This list includes the main modules for the MPT 319/DT-St stainless steel transponder.

Part no.	Item name	Drw. ref.	No. in sys.
-	Technical data	Drw. pos.	Rec.spares
312-089504	MPT 319/DT-St transducer	Figure page 129	1
-	-	N/A	-
299-089523	Electronic chassis	Figure page 129	1
-	Motherboard, Rxamp board and sensors **(1)** (if used) are included	1	-
382-083607	Tx board	Figure page 129	1
-	-	2	-
382-083551	Microcontroller board	Figure page 129	1
-	-	3	-
382-083602	Rx board	Figure page 129	1
-	-	4	-
290-101665	Battery pack (lithium)	Figure page 129	1
-	L10/36 (18/30)	8	-
599-089506	Housing	Figure page 129	1
-	-	9	-

1 Separate DT sensor, refer to page 93.

Accessaries

→ *Refer to the table on page 92.*



Page 1 of 1 (CD4166)	MPT 319/DT-St transponder - exploded view	**102-089498** Rev.A

MPT 319/L-St transponder

This list includes the common spare parts for the MPT 319/L-St transponder.

Complete transponder

Part no.	Item name	Drw. ref.	No. in sys.
-	Technical data	Drw. pos.	Rec.spares
102-089499	MPT 319/L-St Transponder complete	Figure page 131	1
-	All main modules are included	N/A	-

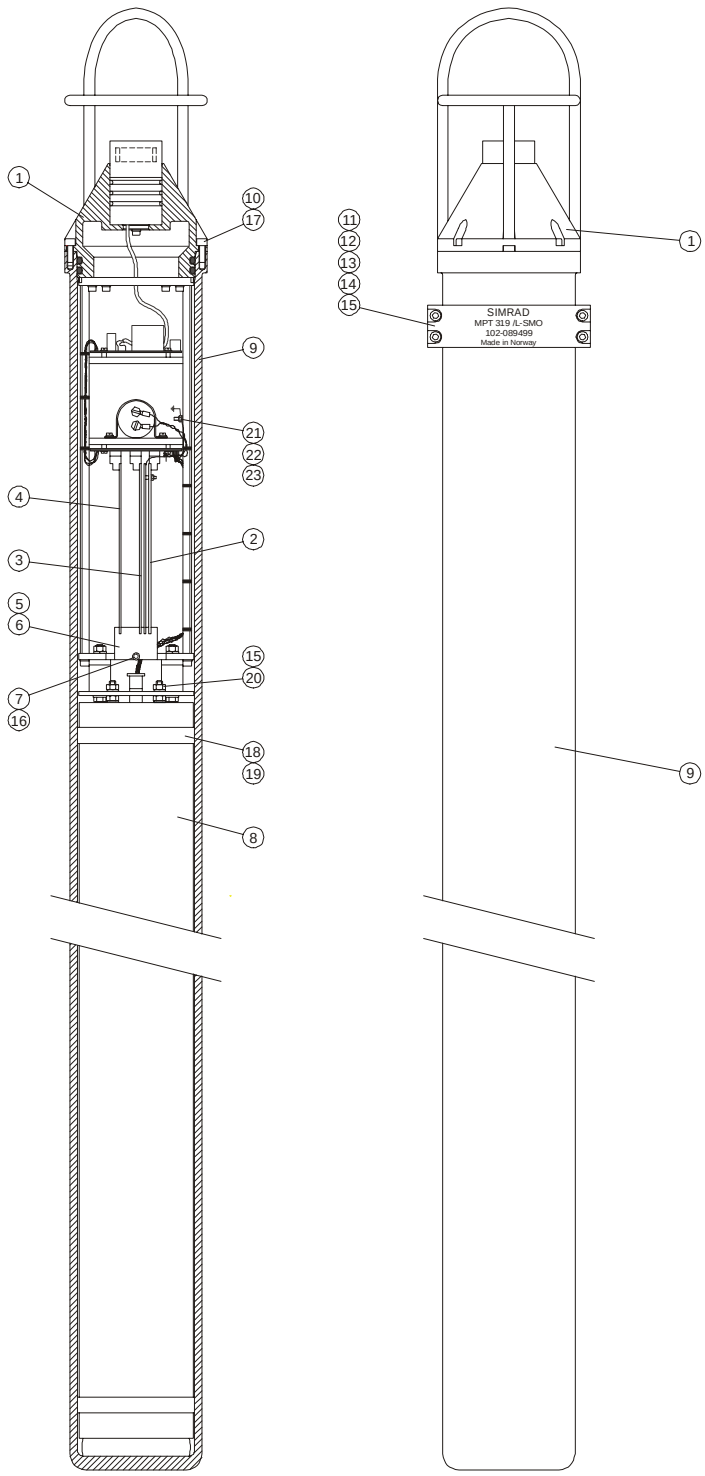
Main modules

This list includes the main modules for the MPT 319/L-St transponder.

Part no.	Item name	Drw. ref.	No. in sys.
-	Technical data	Drw. pos.	Rec.spares
312-089504	MPT 319/L-St transducer	Figure page 131	1
-	-	1	-
299-089523	Electronic chassis	Figure page 131	1
-	Motherboard, Rxamp board and sensors (if used) are included	1	-
382-083607	Tx board	Figure page 131	1
-	-	2	-
382-083551	Microcontroller board	Figure page 131	1
-	-	3	-
382-083602	Rx board	Figure page 131	1
-	-	4	-
290-089505	Battery pack (lithium)	Figure page 131	1
-	L10/36 (36/60)	8	-
599-089507	Housing	Figure page 131	1
-	-	9	-

Accessaries

→ *Refer to the table on page 92.*



Page 1 of 1 (CD4167)	MPT 319/L-St - exploded view	**102-089499** Rev.A

MPT 319/Si transponder

Complete transponder

Part no.	Item name	Drw. ref.	No. in sys.
	Technical data	**Drw. pos.**	**Rec.spares**
102-216000	MPT 319/Si Transponder complete	Figure page 133	1
-	All main modules are included	N/A	-

Main modules

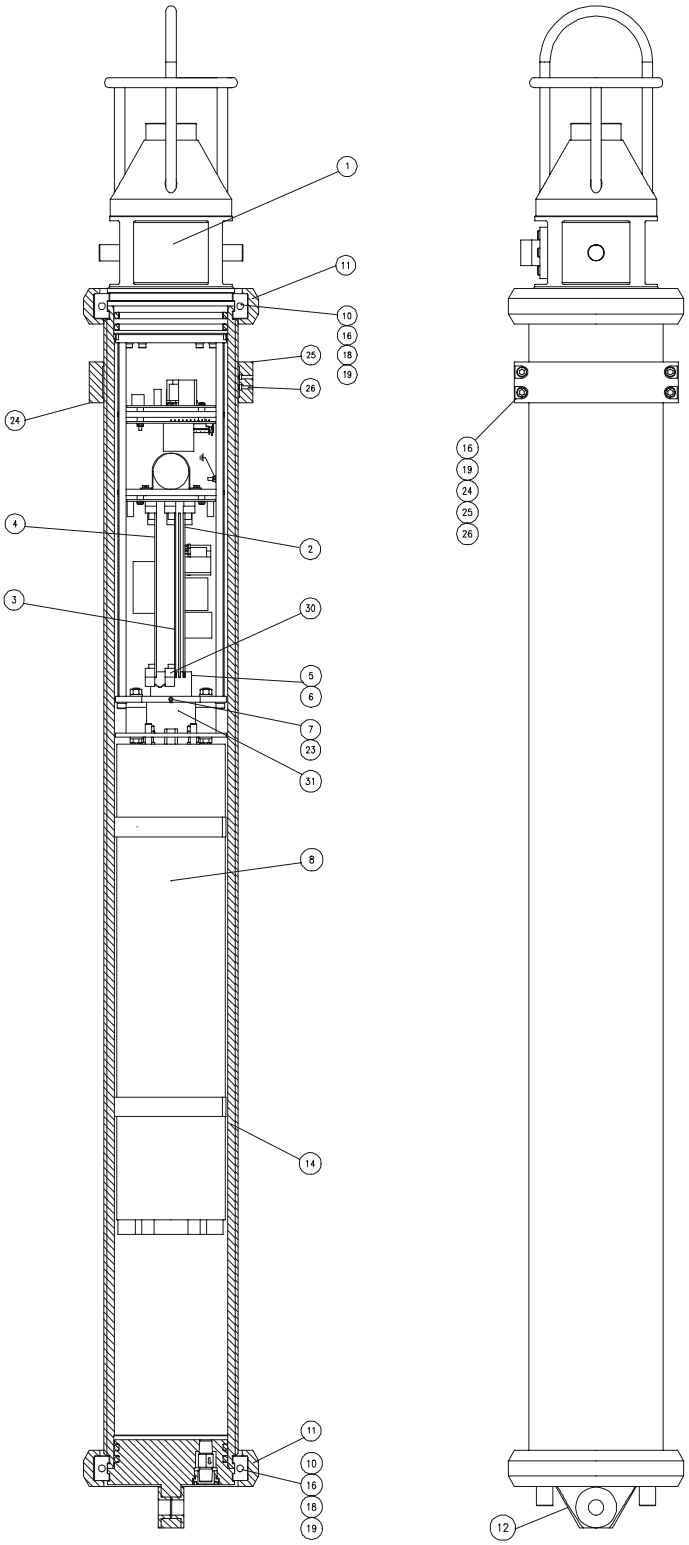
This list includes the main modules for the MPT 319/Si aluminium transponder.

Part no.	Item name	Drw. ref.	No. in sys.
	Technical data	**Drw. pos.**	**Rec.spares**
299-215998	Electronic chassis	Figure page 133	1
-	Transducer **(1)**, Motherboard, Rxamp board, Serial interface board and sensors (if used) are included	1	-
382-083607	Tx board	Figure page 133	1
-	-	2	-
382-083551	Microcontroller board	Figure page 133	1
-	-	3	-
382-083602	Rx board	Figure page 133	1
-	-	4	-
290-101665	Battery pack (lithium)	Figure page 133	1
-	L10/36 (18/30)	8	-
599-089149	Housing	Figure page 133	1
-	-	9	-
599-089263	Bottom end cap	Figure page 135	1
-	-	4	-
379-098646	Sealing cap	Figure page 133	1
-	-	33	-

1 Separate Transducer unit, part. no: 312-073871

Accessaries

→ *Refer to the table on page 92.*



Page 1 of 1 (Cd6541)	MPT 319/Si transponder - exploded view	**860-216001** Rev.A

MPT 319/SiH transponder

Complete transponder

Part no.	Item name	Drw. ref.	No. in sys.
	Technical data	**Drw. pos.**	**Rec.spares**
102-217878	MPT 319/SiH Transponder complete	Figure page 135	1
-	All main modules are included	N/A	-

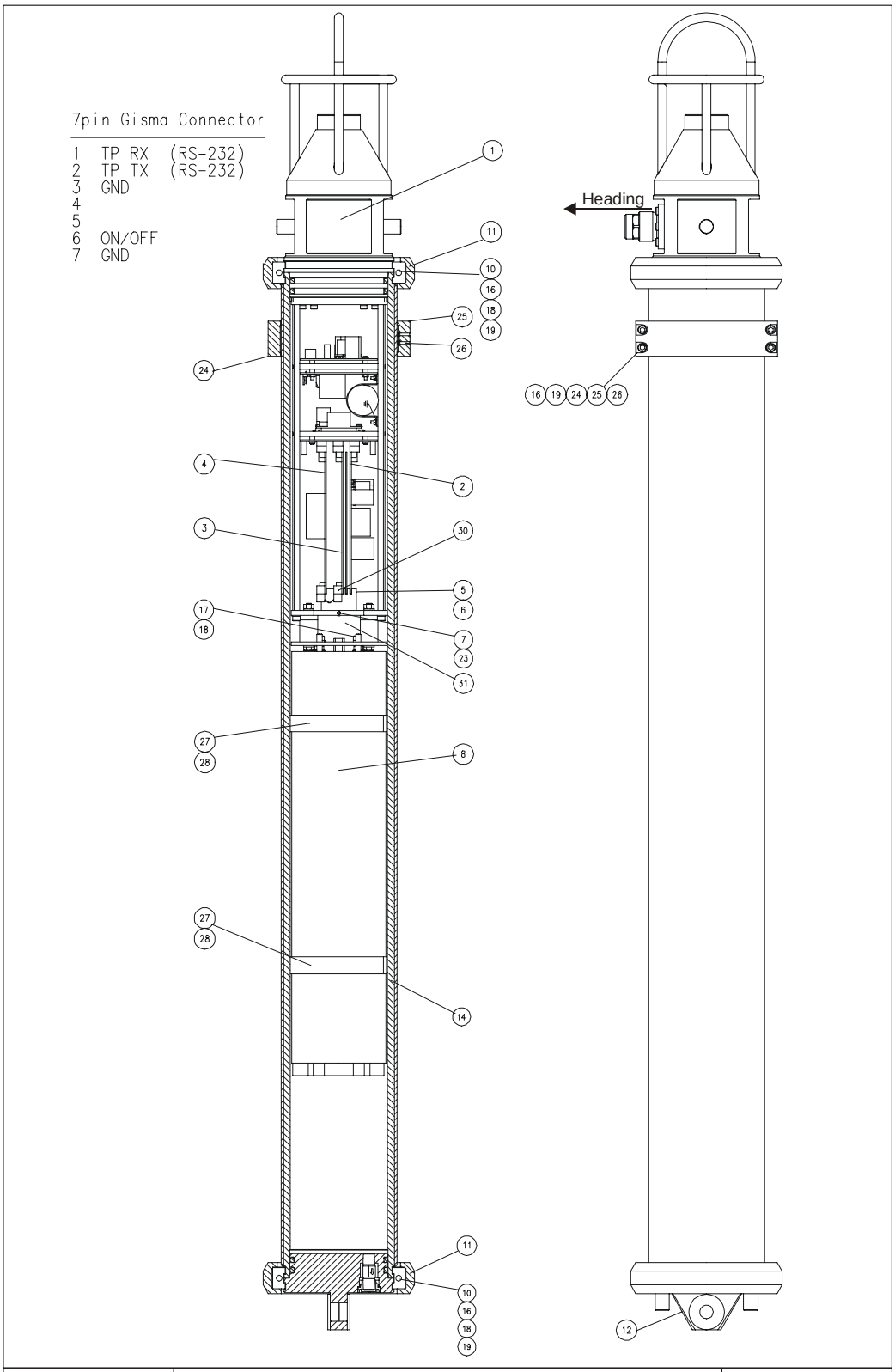
Main modules

This list includes the main modules for the MPT 319/Si aluminium transponder.

Part no.	Item name	Drw. ref.	No. in sys.
	Technical data	**Drw. pos.**	**Rec.spares**
299-217969	Electronic chassis	Figure page 135	1
299-217969	Transducer **(1)**, Motherboard, Rxamp board, Serial interface board and sensors (if used) are included	1	-
382-083607	Tx board	Figure page 135	1
-	-	2	-
382-083551	Microcontroller board	Figure page 135	1
-	-	3	-
382-083602	Rx board	Figure page 135	1
-	-	4	-
290-101665	Battery pack (lithium)	Figure page 135	1
-	L10/36 (18/30)	8	-
599-089149	Housing	Figure page 135	1
-	-	9	-
599-089263	Bottom end cap	Figure page 135	1
-	-	4	-
379-098646	Sealing cap	Figure page 135	1
-	-	33	-

Accessaries

→ *Refer to the table on page 92.*



Page 1 of 1 (Cd6982)	MPT 319/SiH transponder - exploded view	**860-217879** Rev.A

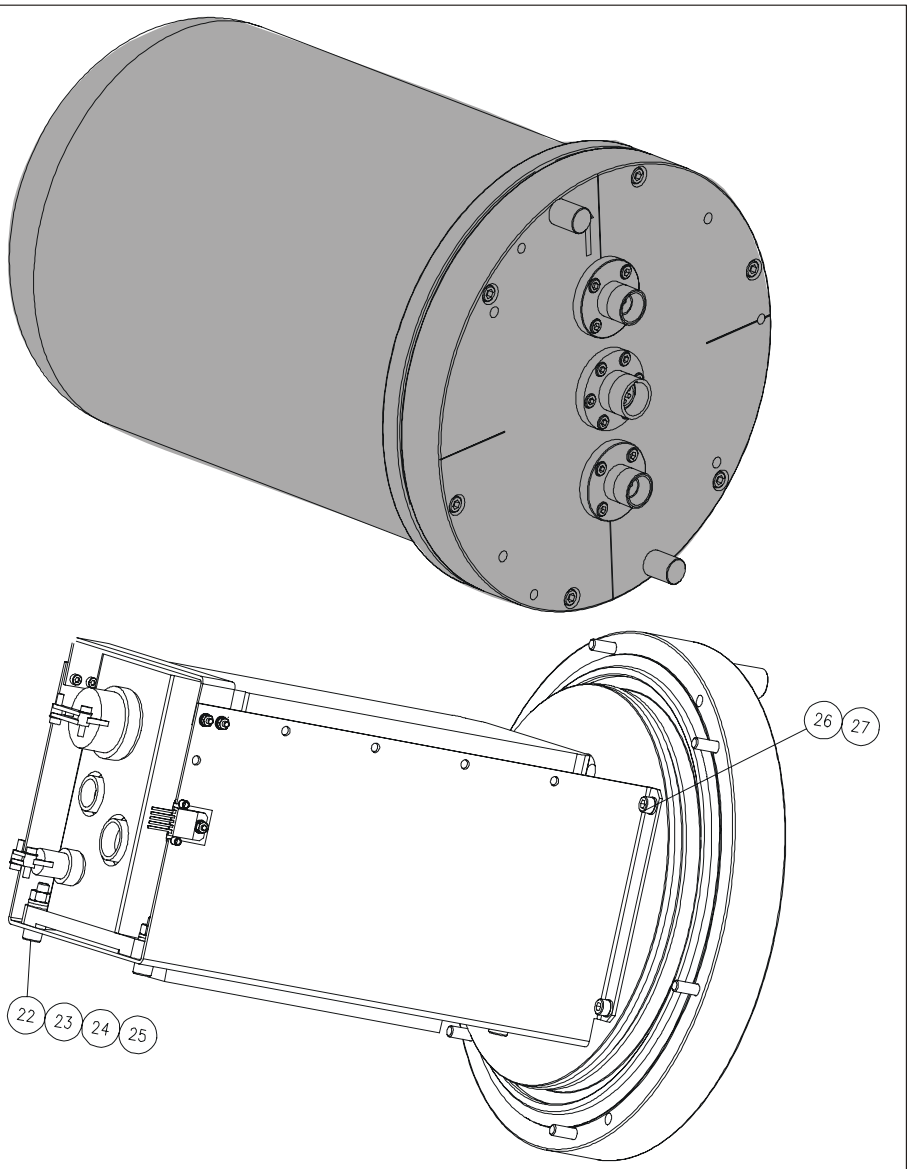
Octans module

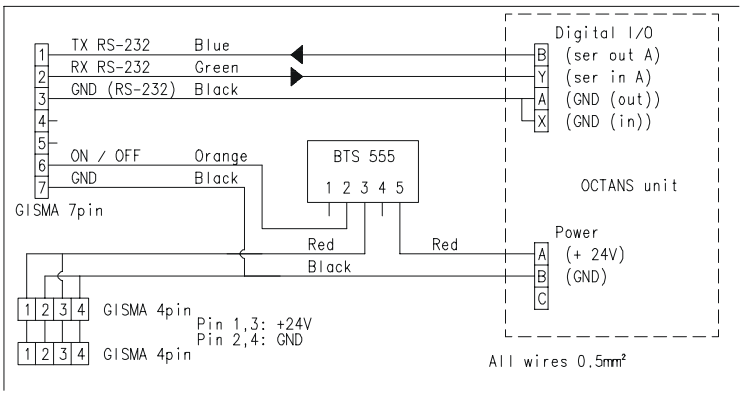
Part no.	Item name	Drw. ref.	No. in sys.
-	Technical data	Drw. pos.	Rec.spares
129-217849	Octans module complete	Figure page 137	1
-	-	-	-
298-097741	Octans fibre-optic gyro compass	-	1
-	-	-	-

Cables

Cable between the Octans and the transopnder Reg. no: 380-098774

Cable between the Octans and the battery unit Reg. no: 380-098773





Note:
The drawing is not in scale.

Page 1 of 1 (CD7003)	Octans module	**861-217850** Rev.A

Battery unit L24

Complete unit

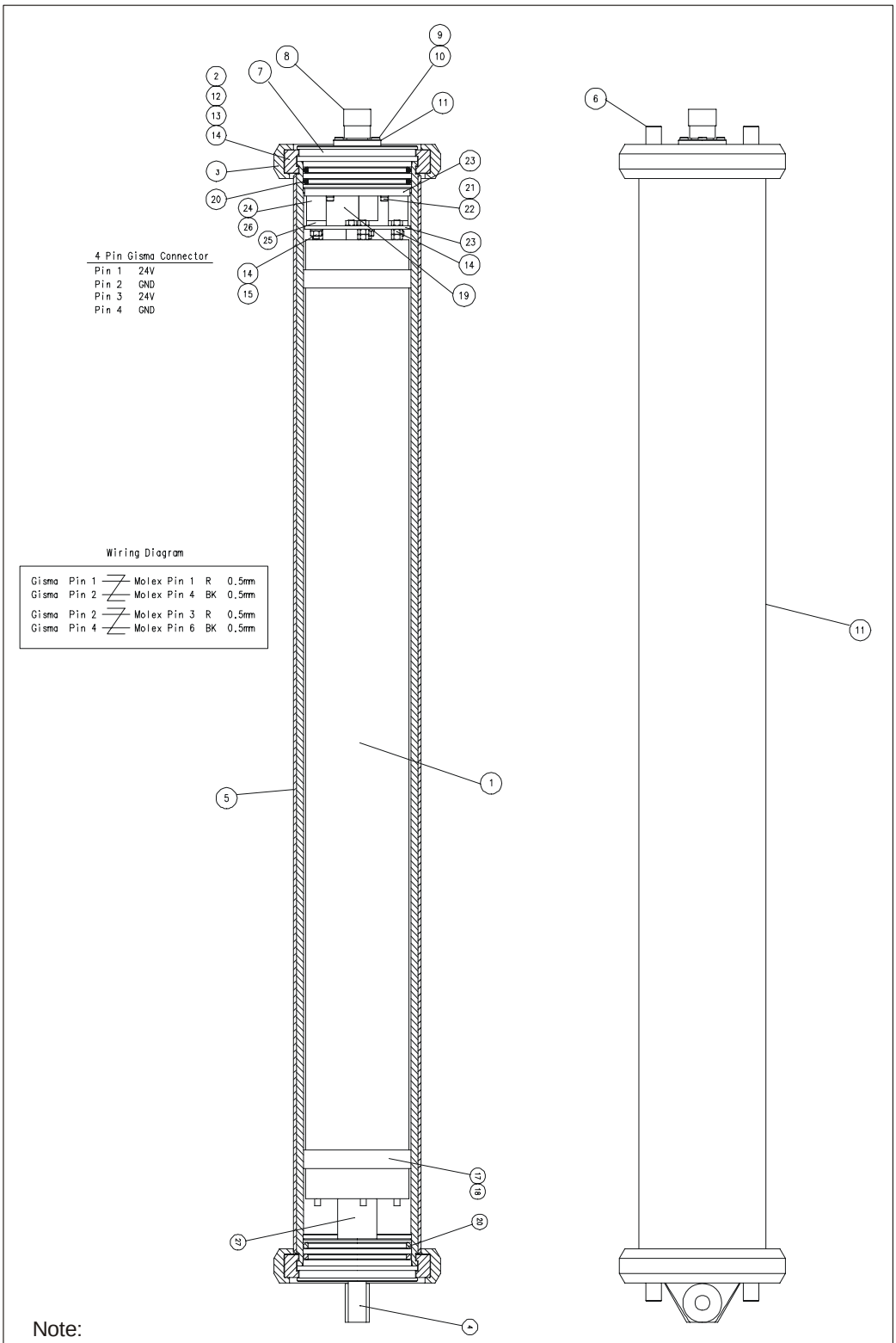
This battery unit is used for powering the Octans module.

Part no.	Item name	Drw. ref.	No. in sys.
-	Technical data	Drw. pos.	Rec.spares
107-217844	Battery unit L24 complete	Figure page 139	1
-	-	-	-

Main modules

This list includes the main modules for the battery unit.

Part no.	Item name	Drw. ref.	No. in sys.
-	Technical data	Drw. pos.	Rec.spares
290-219492	Battery pack	Figure page 139	1
-	(89)	1	-
599-089149	Housing	Figure page 139	1
-	-	5	-
599-089149	Top end cap	Figure page 139	1
-	w/Gisma connector	7	-
599-089263	Bottom end cap	Figure page 139	1
-	-	4	-


4 Pin Gisma Connector
Pin 1 24V
Pin 2 GND
Pin 3 24V
Pin 4 GND
Wiring Diagram
Gisma Pin 1 — Molex Pin 1 R 0.5mm
Gisma Pin 2 — Molex Pin 4 BK 0.5mm
Gisma Pin 2 — Molex Pin 3 R 0.5mm
Gisma Pin 4 — Molex Pin 6 BK 0.5mm
Note:
The drawing is not in scale.
Page 1 of 1 (CD7000)
Subsea Battery Unit
860-217845
Rev.A

MPT 316/DT EEx transponder

Complete transponder

Part no.	Item name	Drw. ref.	No. in sys.
-	Technical data	Drw. pos.	Rec.spares
102-089500	MPT 316/DT EEx Transponder complete	Figure page 141	1
-	All main modules are included	N/A	-

Main modules

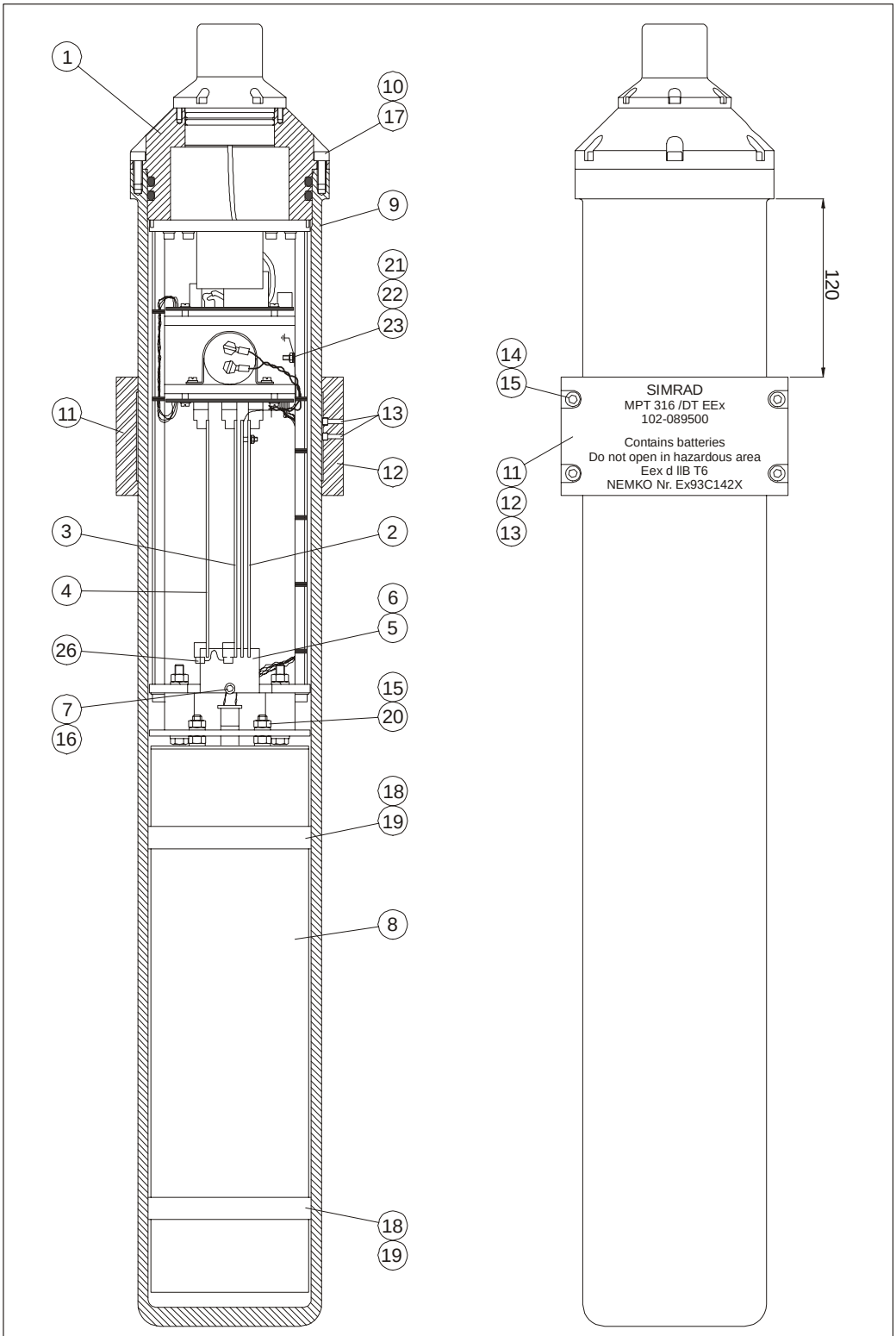
This list includes the main modules for the MPT 316/DT EEx transponder.

Part no.	Item name	Drw. ref.	No. in sys.
-	Technical data	Drw. pos.	Rec.spares
312-089020	MPT 316/DT EEx transducer	Figure page 141	1
-	-	N/A	-
299-089524	Eletrical chassis	Figure page 141	1
-	Motherboard, Rxamp board and sensors **(1)** (if used) are included	N/A	-
382-083607	Tx board	Figure page 141	1
-	-	2	-
382-083551	Microcontroller board	Figure page 141	1
-	-	3	-
382-083602	Rx board	Figure page 141	1
-	-	4	-
290-089501	Battery pack (lithium)	Figure page 141	1
-	L10/36 (15/20)	8	-
599-089496	Housing	Figure page 141	1
-	-	9	-

1 Separate DT sensor, refer to page 93.

Accessaries

→ *Refer to the table on page 92.*



Page 1 of 1 (CD4165)	MPT 316/DT EEx transponder - exploded view	**102-089500** Rev.C

MPT 316/EEx 90 transponder

Complete transponder

Part no.	Item name	Drw. ref.	No. in sys.
	Technical data	**Drw. pos.**	**Rec.spares**
102-089745	MPT 316/EEx 90 Transponder complete	Figure page 143	1
	All main modules are included	N/A	

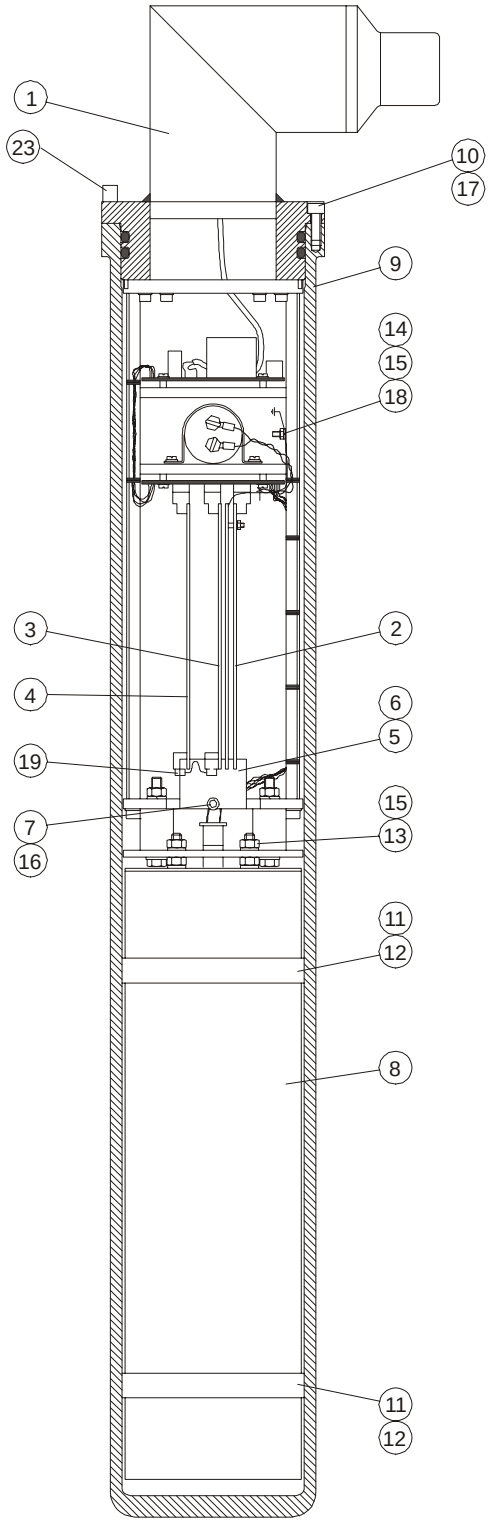
Main modules

This list includes the main modules for the MPT 316/EEx 90 transponder.

Part no.	Item name	Drw. ref.	No. in sys.
-	**Technical data**	**Drw. pos.**	**Rec.spares**
312-089020	MPT 316/EEx 90 Transducer	Figure page 143	1
-	-	N/A	-
299-089524	Eletrical chassis	Figure page 143	1
-	Motherboard, Rxamp board and sensors (if used) are included	N/A	-
382-083607	Tx board	Figure page 143	1
-	-	2	-
382-083551	Microcontroller board	Figure page 143	1
-	-	3	-
382-083602	Rx board	Figure page 143	1
-	-	4	-
290-089501	Battery pack (lithium)	Figure page 143	1
-	L10/36 (15/20)	8	-
599-102653	Housing	Figure page 143	1
-	-	9	-
N/A	Locking pin	Figure page 143	1
-	-	23	-

Accessaries

→ *Refer to the table on page 92.*



Page 1 of 1 (CD4168)	MPT 316/EEx 90 transponder - exploded view	**102-089745** Rev.C

DRAWING FILE

Overview

This section contains outline dimensions drawings. The illustrations are based on the original system drawings.

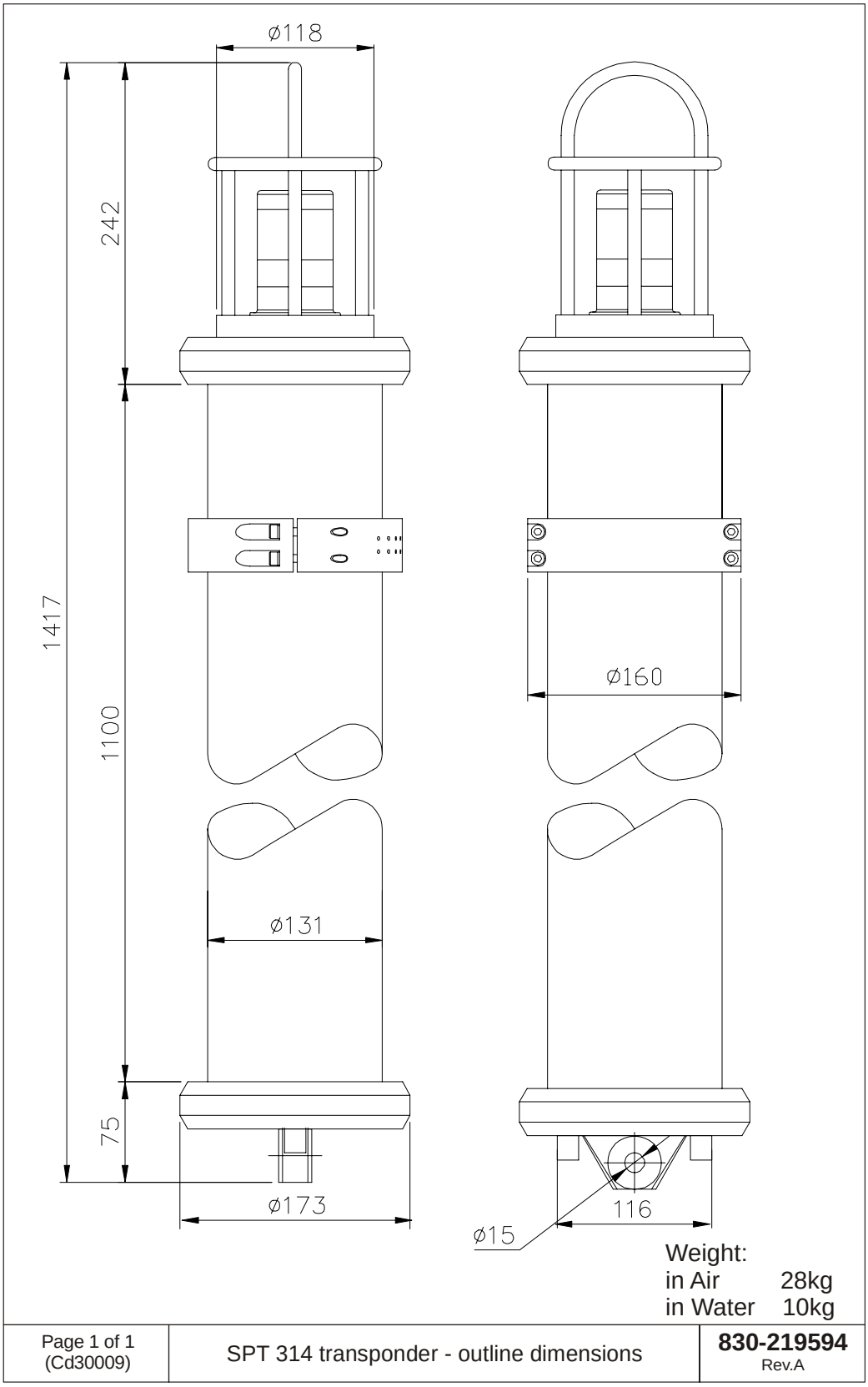
- All measurements are in mm.
- The illustrations are not in scale.
- The original drawings are available in electronic format (AutoCAD) upon request.

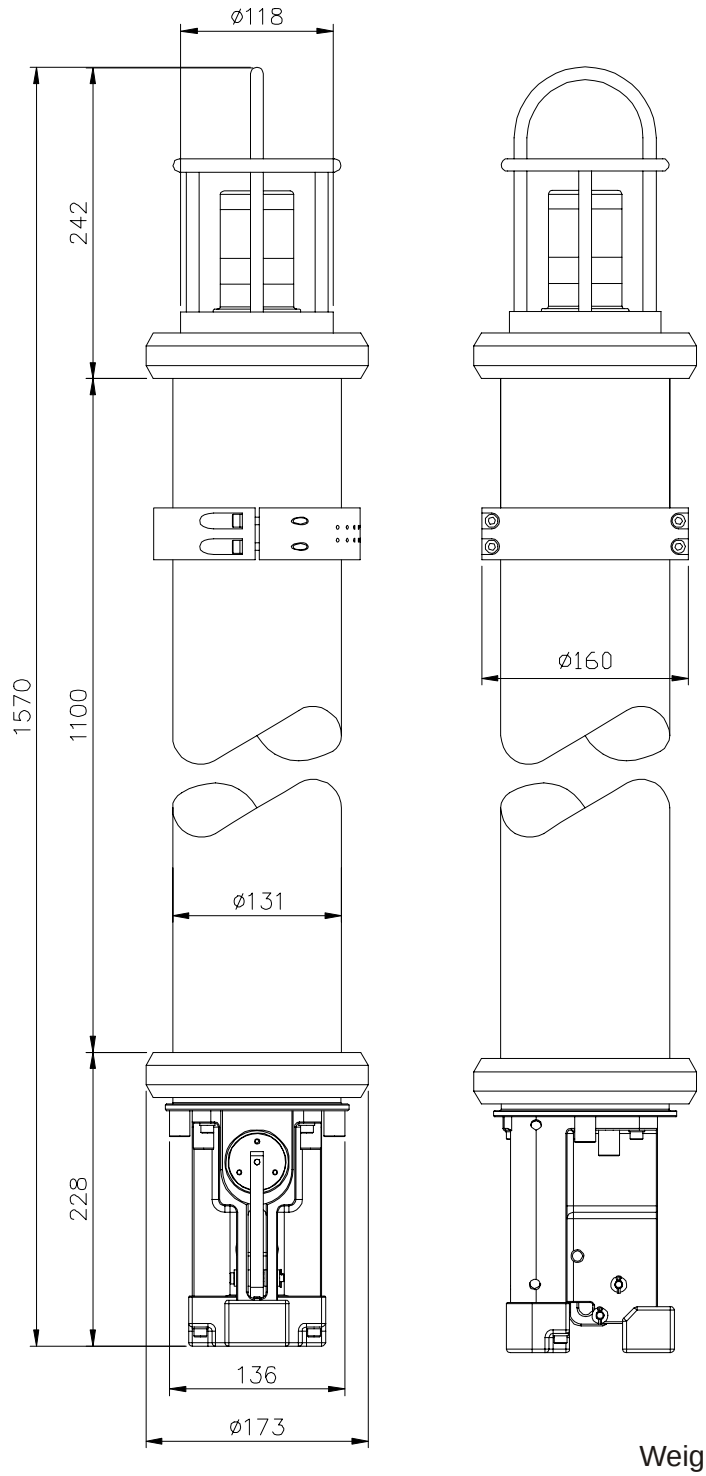
Drawings

The following outline dimensions drawings are implemented:

- **SPT 314 Aluminium**
  - SPT 314 and SPT 314/I, page 146.
  - SPT 314/R, page 147.
- **SPT 319 Aluminium**
  - SPT 319, SPT 319/H and SPT 319/I, page 153.
  - SPT 319/R, page 154.
  - SPT 319/S, page 148.
  - SPT 319/S, transducer unit, page 149.
- **MPT 313 Aluminium**
  - MPT 313, page 150.
  - MPT 313/S and MPT 313/RS, page 151.
  - MPT 313/S transducer unit, page 152.
- **MPT 319 Aluminium**
  - MPT 319 and MPT 319/DT, page 153.
  - MPT 319/R and MPT 319/DTR, page 154.
  - MPT 319/Si and MPT 319/SiH, page 157.
- **MPT 319 Stainless steel**
  - MPT 319/DT-St, page 155.
  - MPT 319/L-St, page 156.
- **MPT 316 Stainless steel**
  - MPT 316/DT EEx, page 158.
  - MPT 316/EEx 90, page 159.

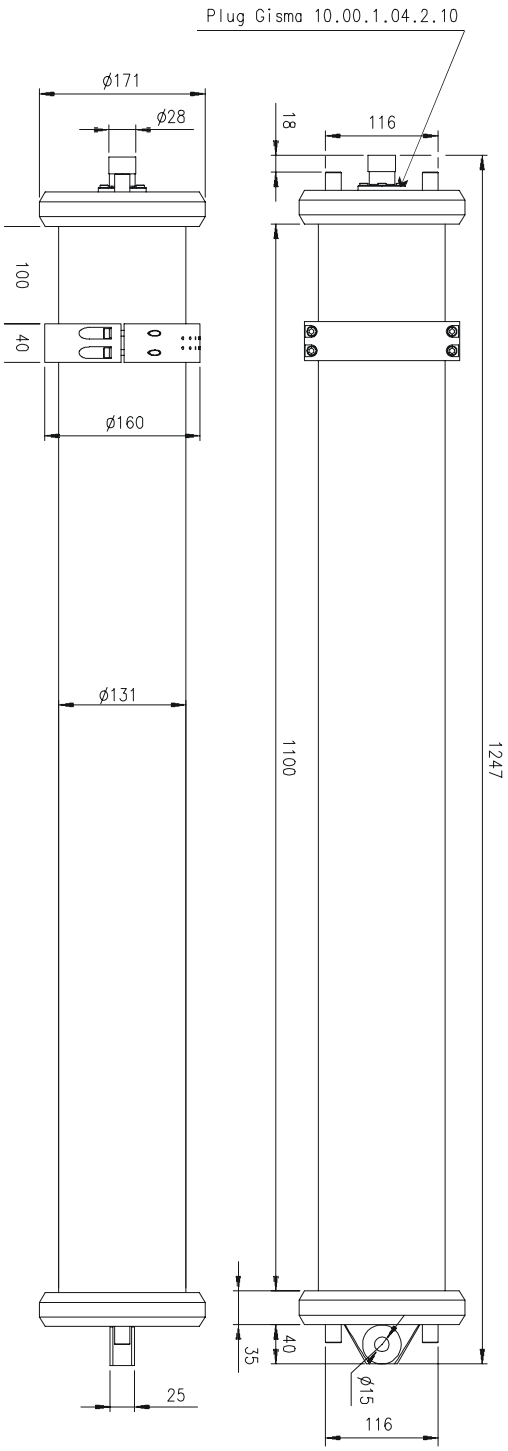
- **Floating collars**
  - Refer to page 160.
- **Guiding collars**
  - Aluminium transponder, refer to page 161.
- **Special modules**
  - Battery unit L24, page 162.
  - Octans module, page 163.


ø118
242
1417
1100
ø160
ø131
75
ø173
116
ø15
Weight:
in Air 28kg
in Water 10kg
Page 1 of 1
(Cd30009)
SPT 314 transponder - outline dimensions
830-219594
Rev.A



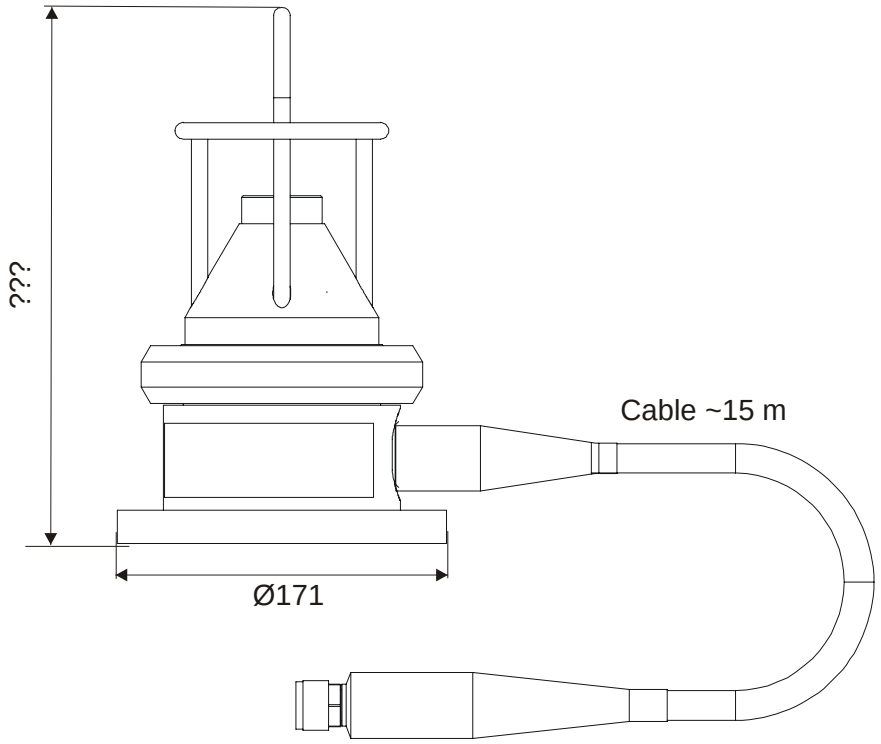
Weight:
in Air 31kg
in Water 11kg

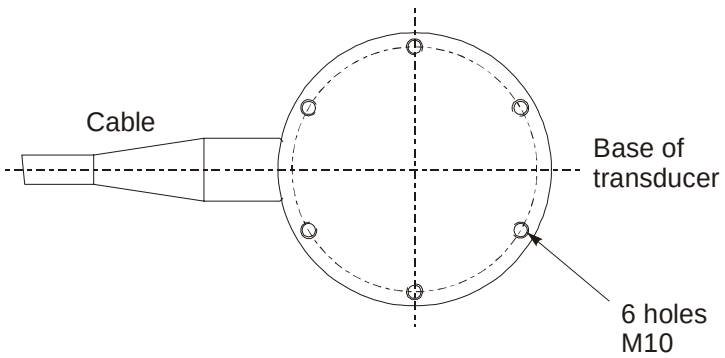
Page 1 of 1 (Cd30008)	SPT 314/R transponder - outline dimensions	**830-219595** Rev.A



Weight:
in Air ~27kg
in Water ~11kg

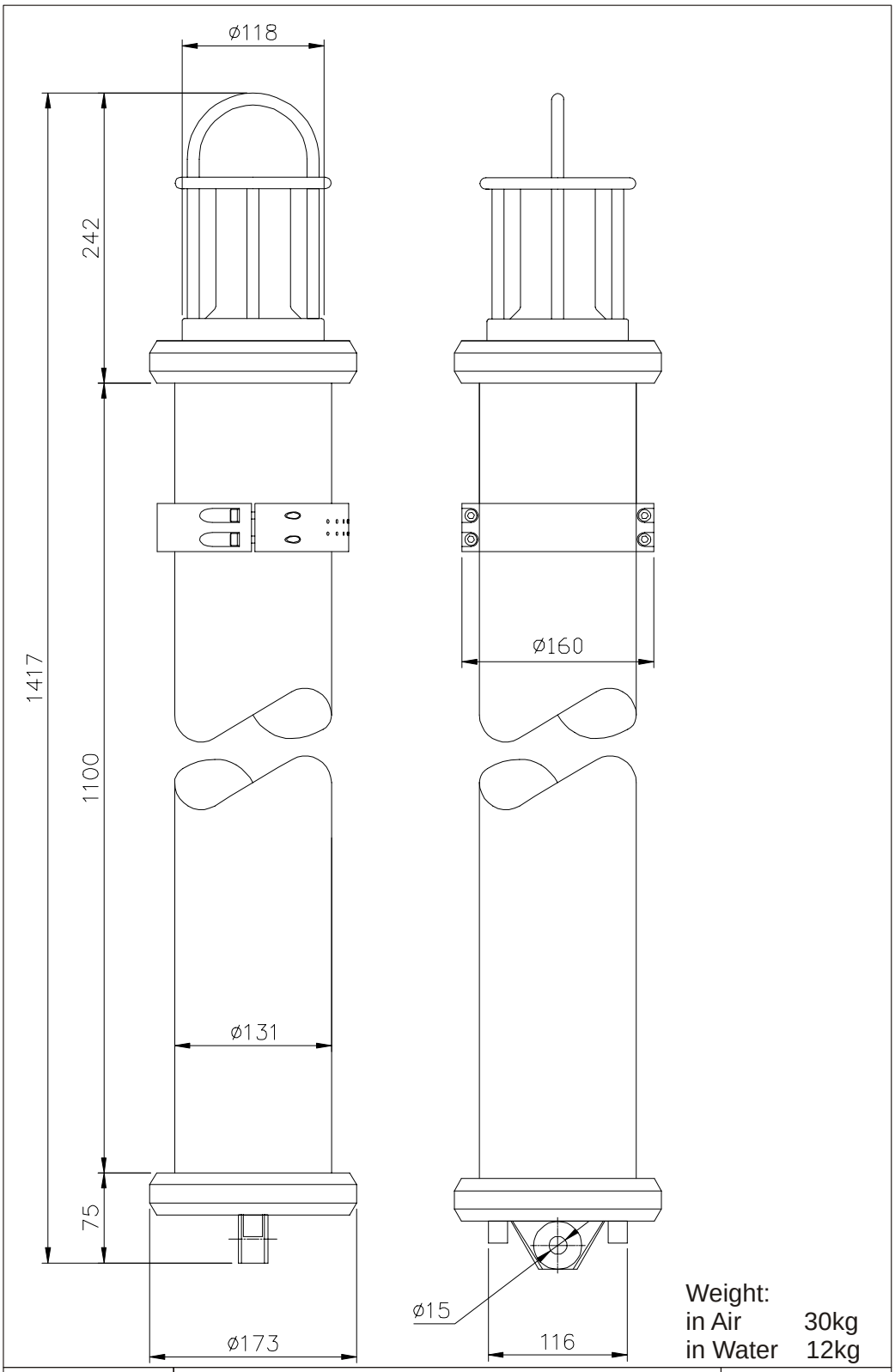
Page 1 of 1 (Cd30041)	SPT 319/S transponder - outline dimensions	**N/A**



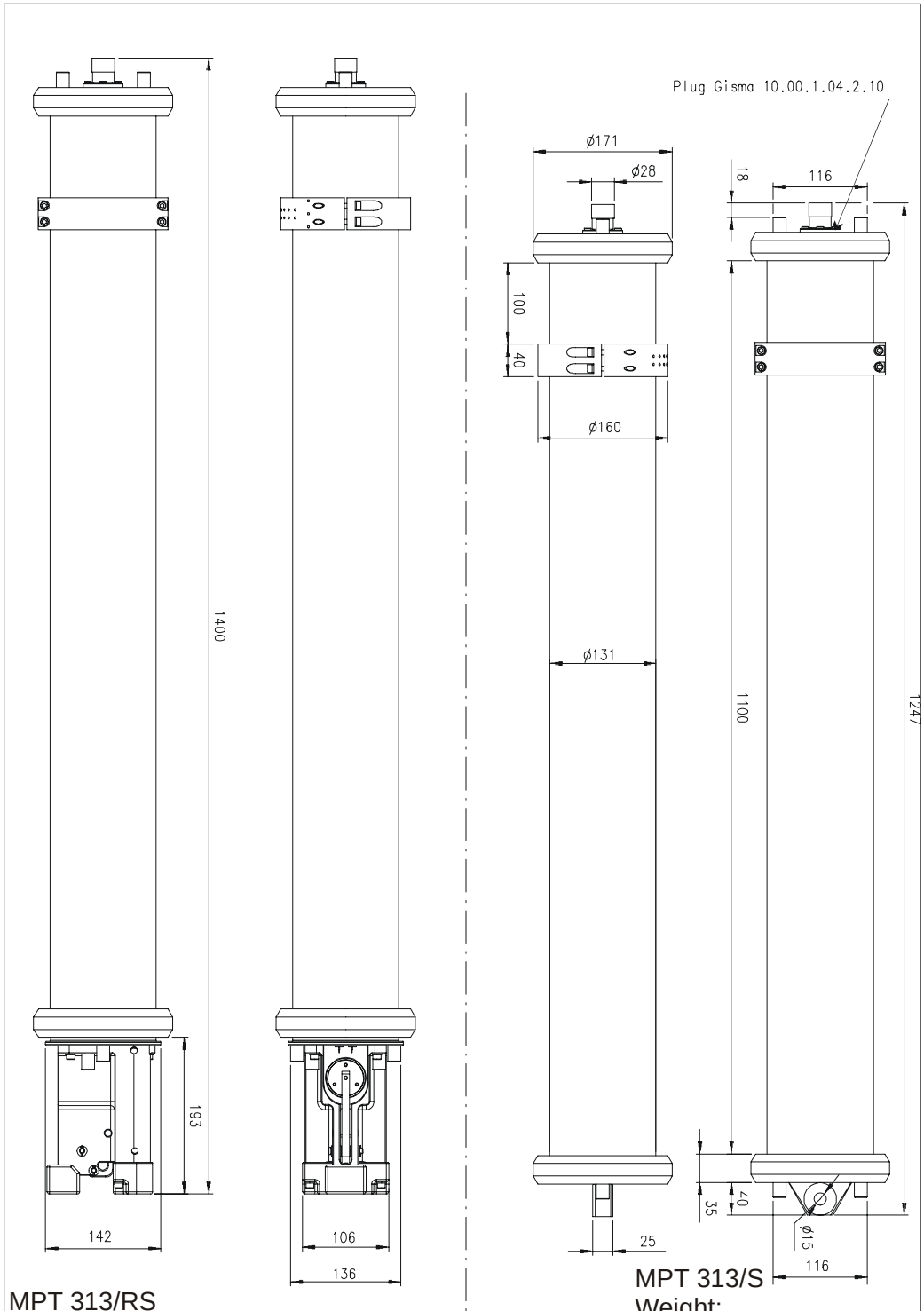


Weight:
In Air ~12kg
in Water ~5kg

Page 1 of 1 (Cd30042)	SPT 319/S transducer unit - outline dimensions	**N/A**



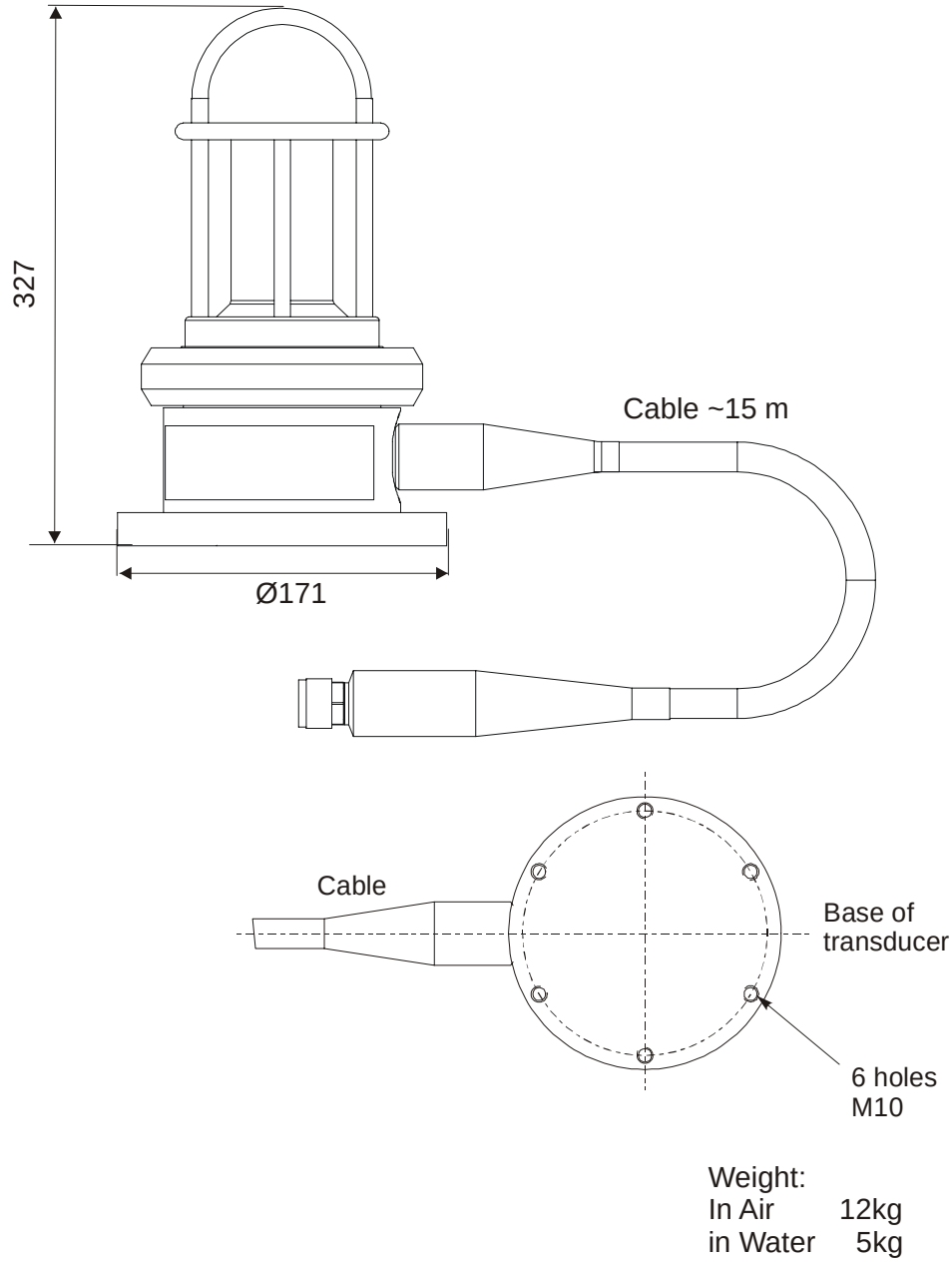
Page 1 of 1 (Cd30010)	MPT 313 transponder - outline dimensions	**830-219592** Rev.A



MPT 313/RS
Weight:
in Air 30kg
in Water 12kg

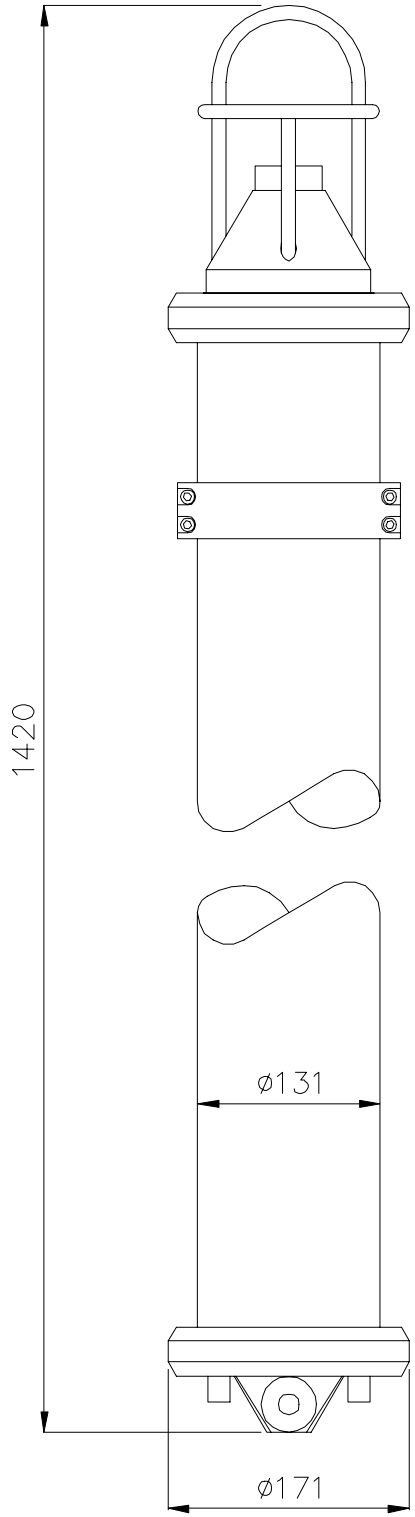
MPT 313/S
Weight:
in Air 27kg
in Water 11kg

Page 1 of 2 (Cd30020)	MPT 313/S and MPT 313/RS transponder - outline dimensions	**830-217307** Rev.B



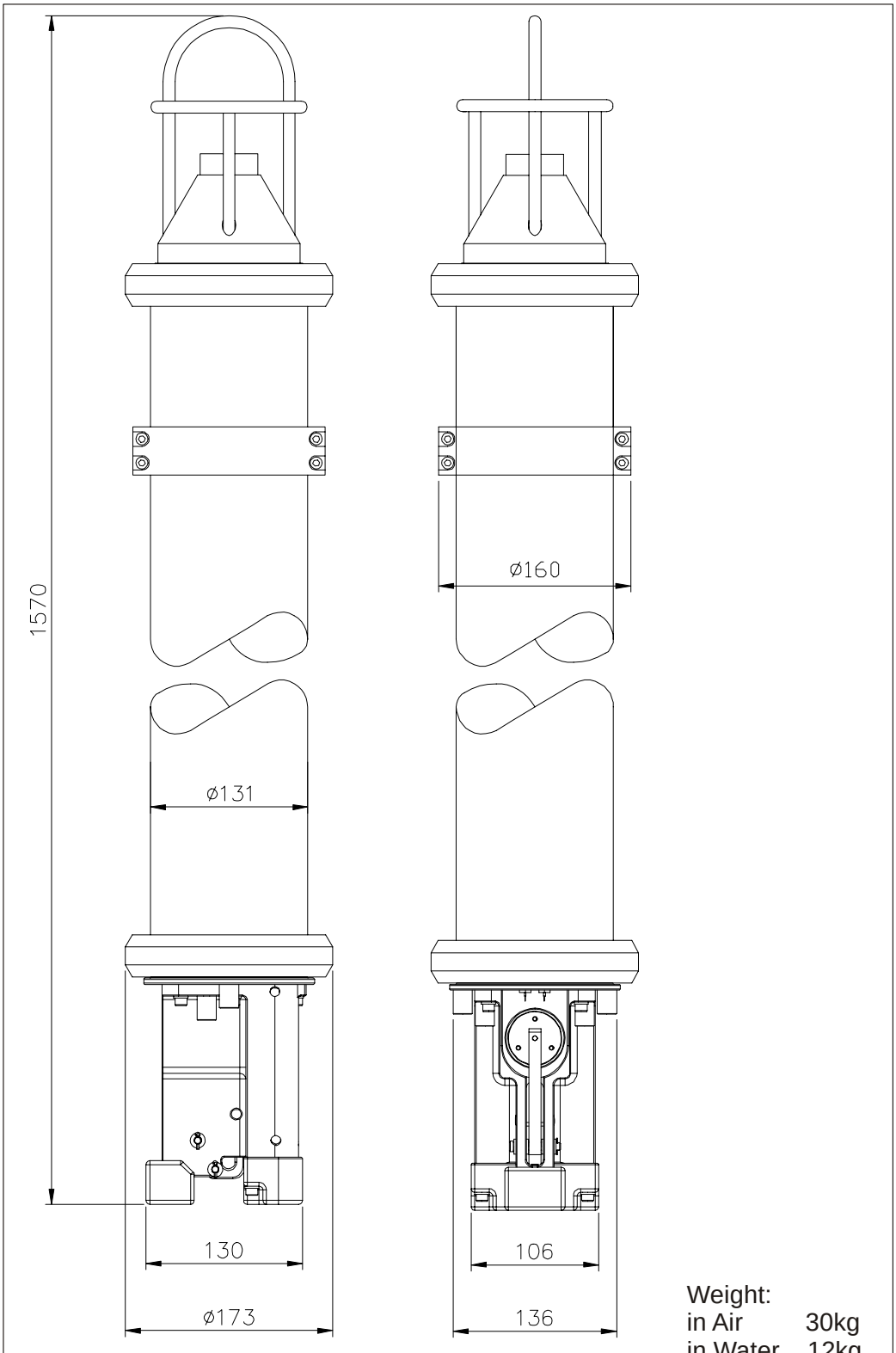
Weight:
In Air 12kg
in Water 5kg

Page 1 of 1 (Cd30041)	MPT 313/S and MPT 313/RS transducer unit - outline dimensions	**N/A**

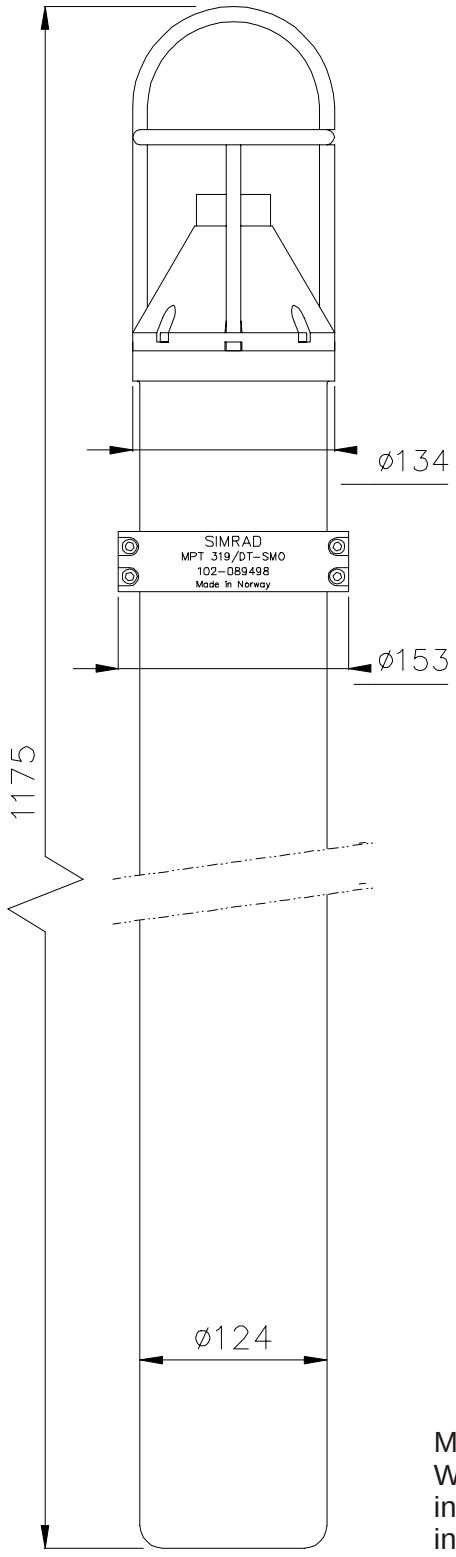


Weight:
in Air 25.5kg
in Water 9.5kg

Page 1 of 1 (Cd30013)	MPT 319 and SPT 319 transponder - outline dimensions	**830-089417** Rev.B

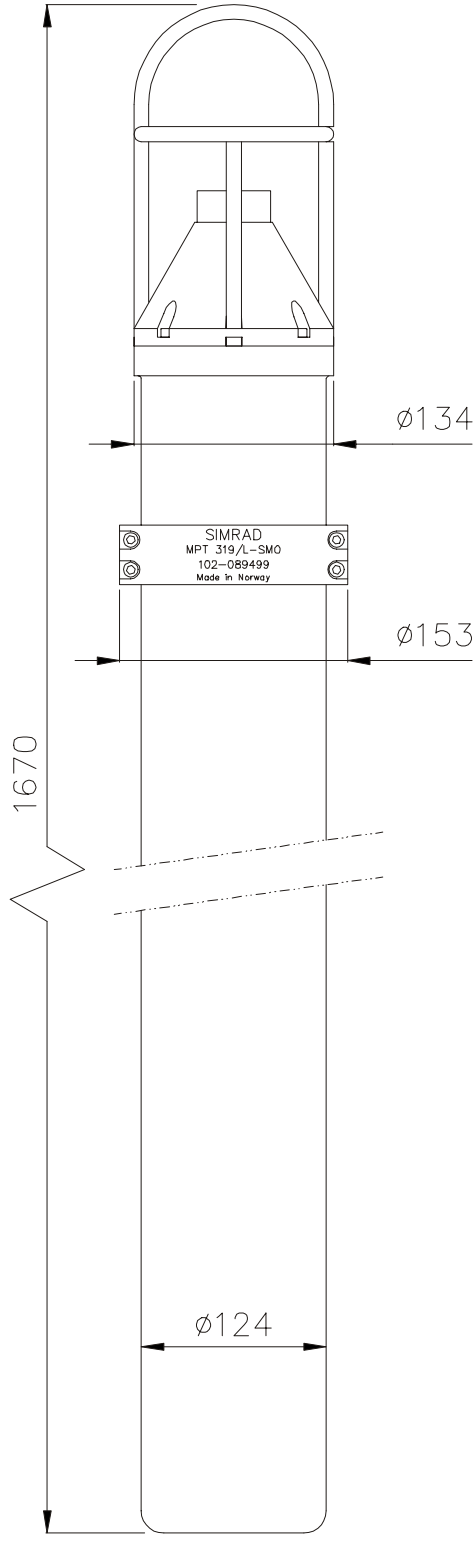


Page 1 of 1 (Cd30014)	MPT 319/R and SPT 319/R transponder - outline dimensions	**830-089418** Rev.B



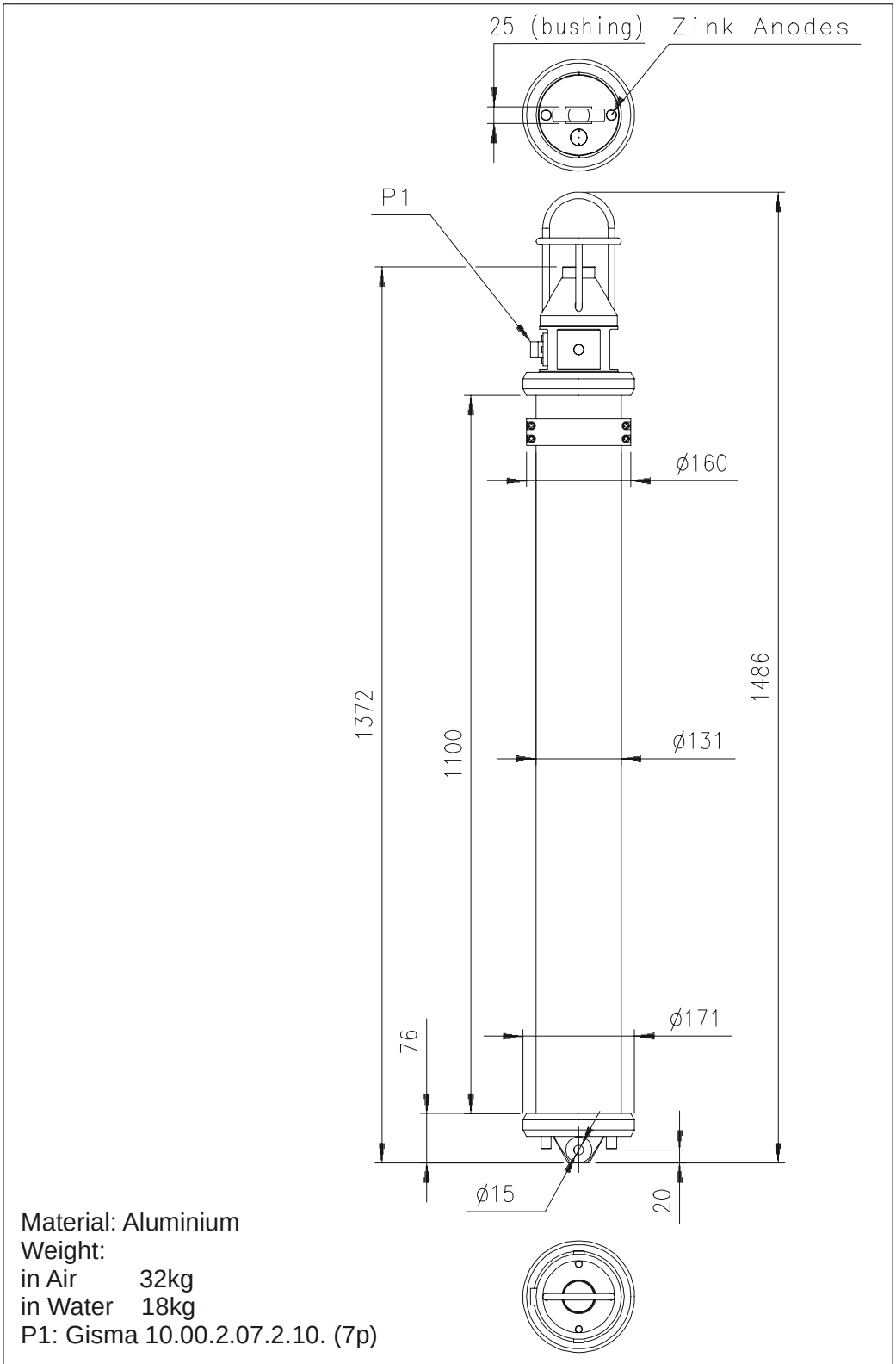
Material: 254SMO (UNS S31254)
Weight:
in Air 37kg
in Water 25kg

Page 1 of 1 (Cd30015)	MPT 319/DT-St transponder - outline dimensions	**830-089450** Rev.B



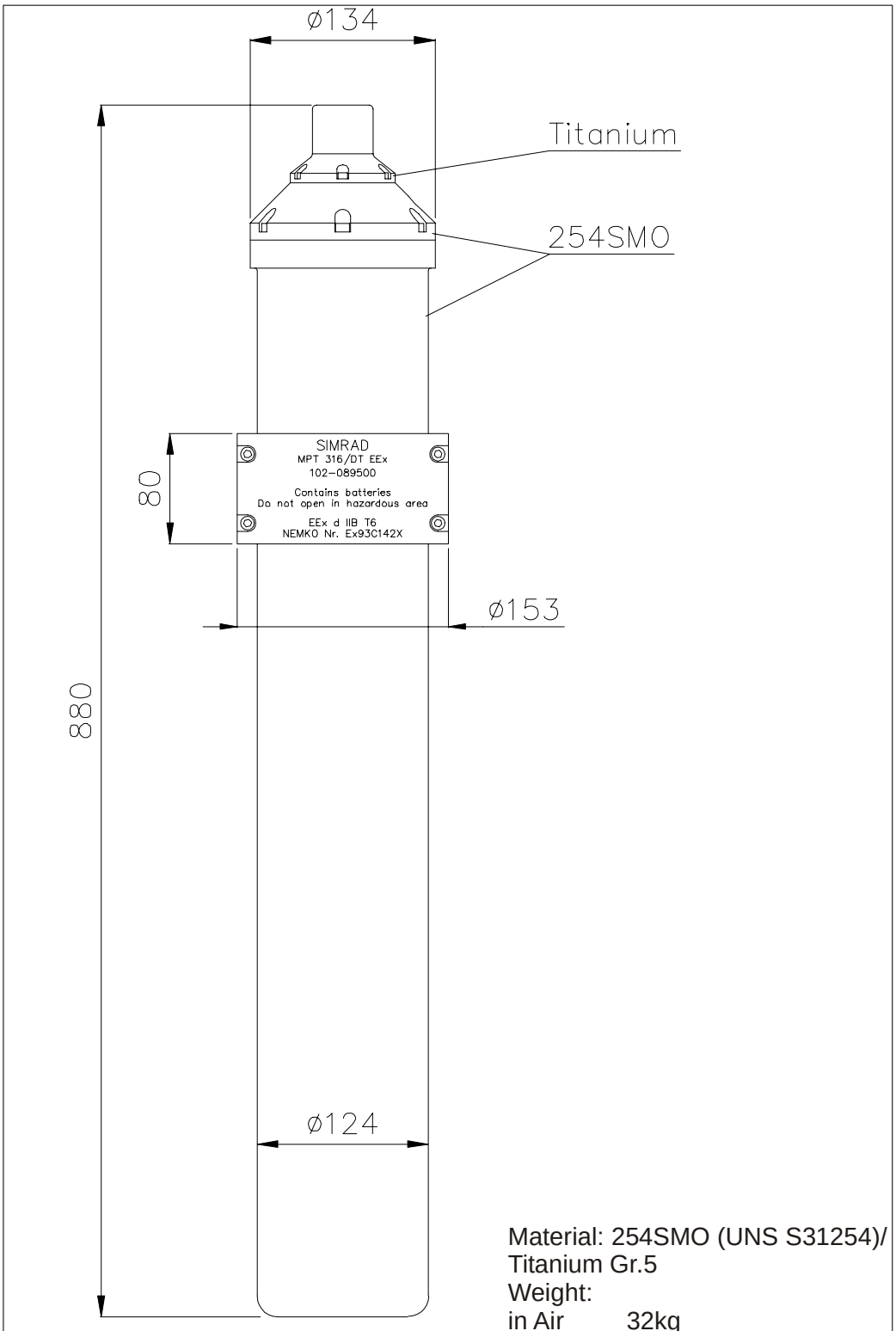
Material: 254SMO (UNS S31254)
Weight:
in Air 54kg
in Water 36kg

Page 1 of 1 (Cd30016)	MPT 319/L-St transponder - outline dimensions	**830-089451** Rev.B

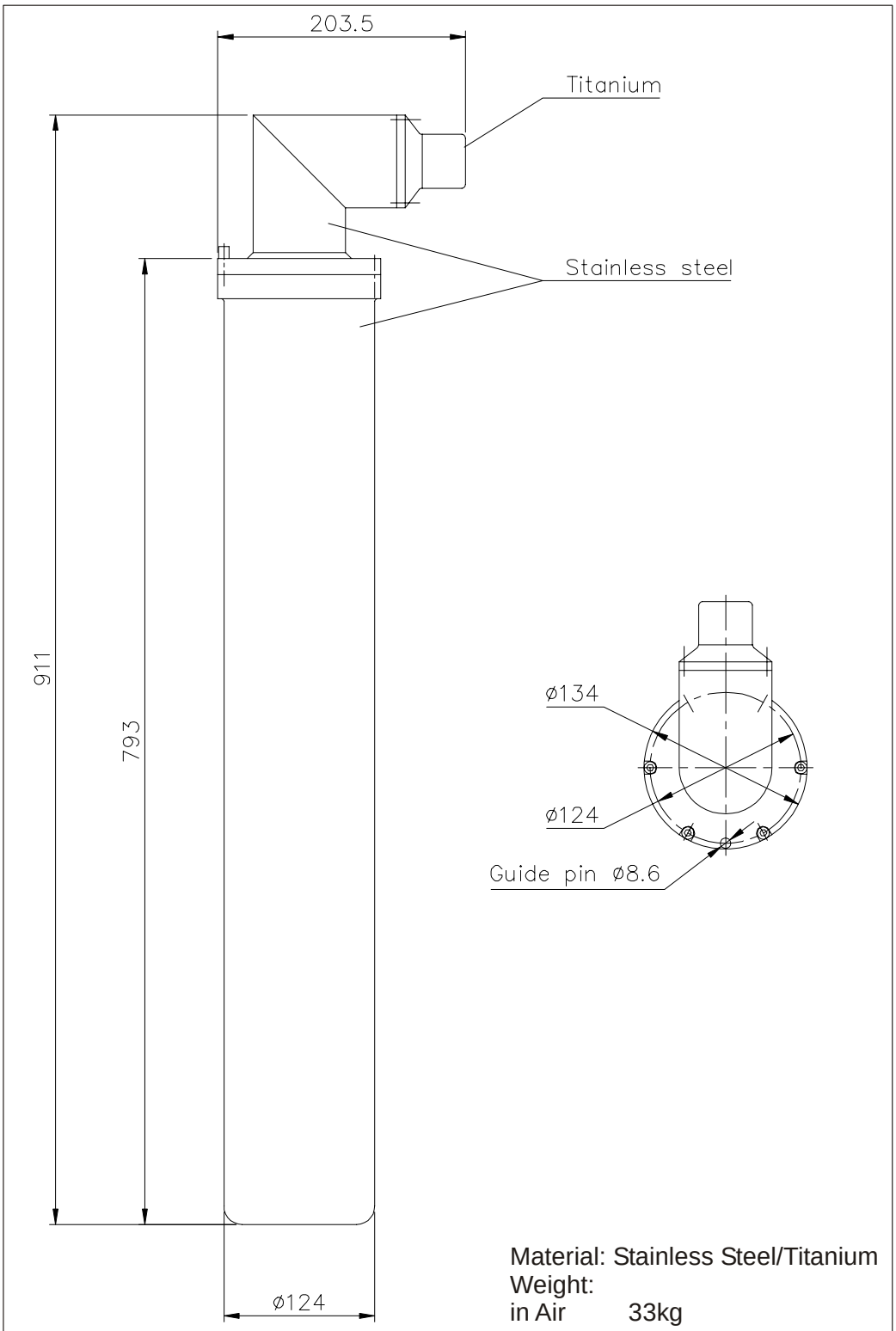


Material: Aluminium
Weight:
in Air 32kg
in Water 18kg
P1: Gisma 10.00.2.07.2.10. (7p)

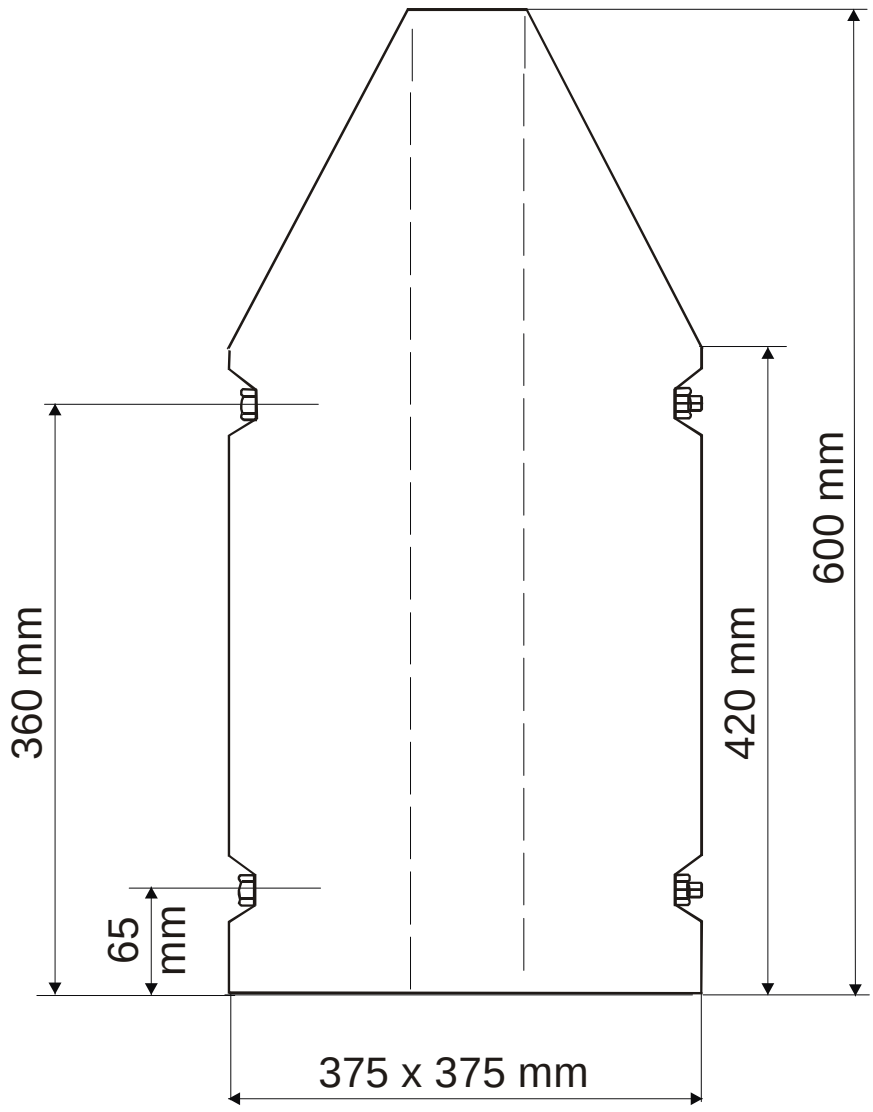
Page 1 of 3 (Cd30030)	MPT 319/Si and MPT 319/SiH transponders - outline dimensions	**830-216124** Rev.A



Page 1 of 1 (Cd30012)	MPT 316 EEx-St transponder - outline dimensions	**830-089449** Rev.C



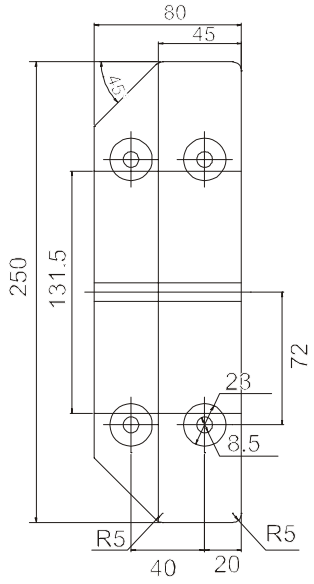
Page 1 of 1 (Cd30011)	MPT 316 EEx 90 transponder - outline dimensions	**830-089744** Rev.A

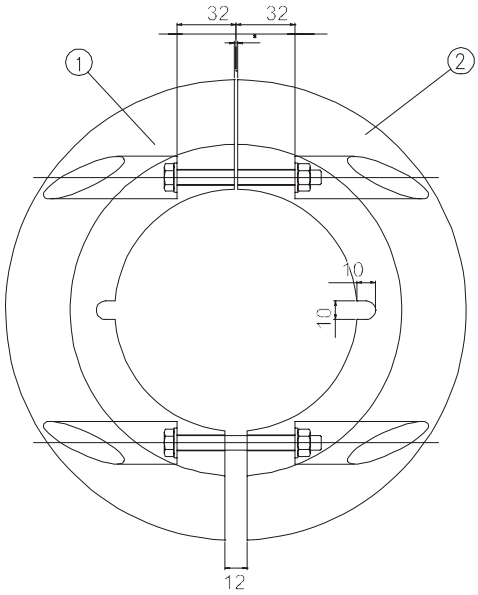


Weigh in Air 34.5kg
total buoyancy in Water 30kg

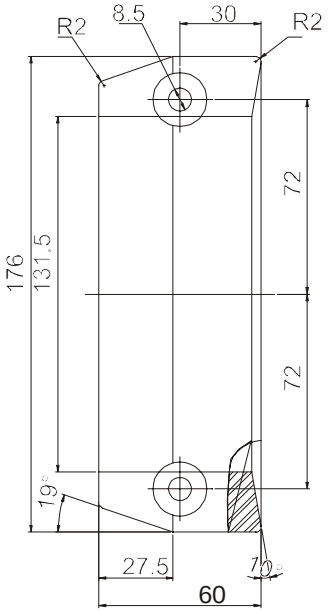
Page 1 of 1 (CD30040)	Guiding collar for SPT / MPT transponders 1000 m - outline dimensions	**N/A**

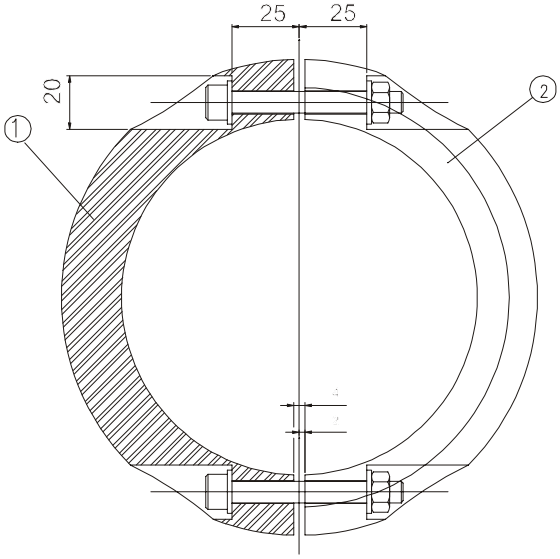
2 Upper Collar Part 2
1 Upper Collar Part 1





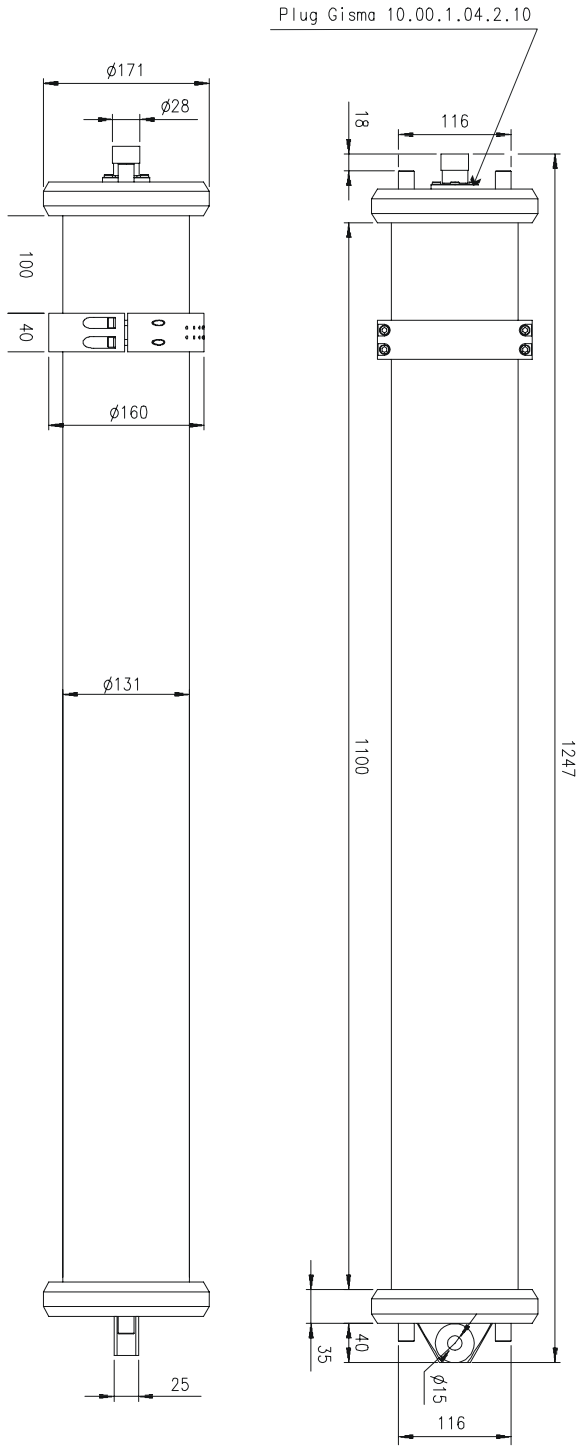
2 Lower Collar Part 2
1 Lower Collar Part 1





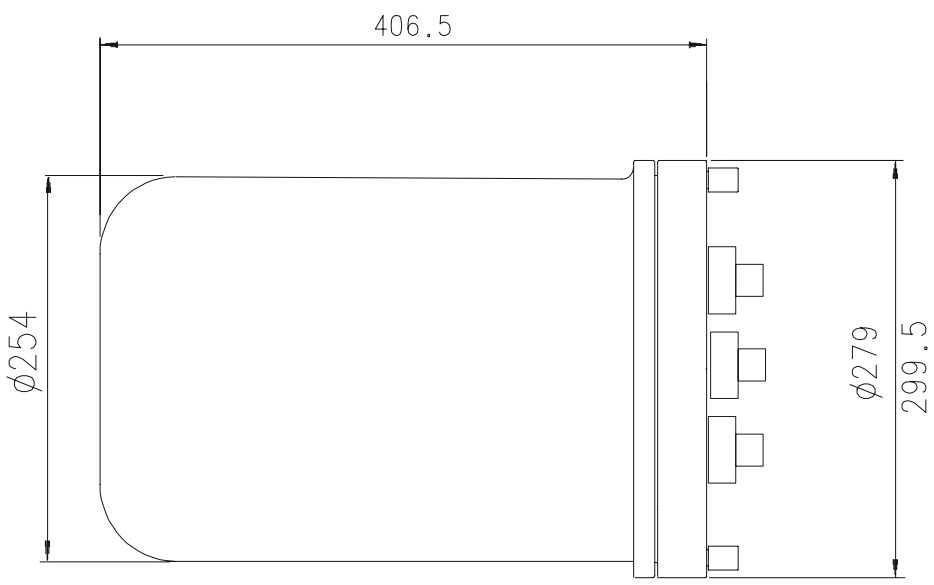
Weigh total:
in Air ~3kg
in Water ~1kg

Page 1 of 1 (CD30039)	Guiding collar for SPT / MPT transponders 1000 m - outline dimensions	198-086386 / 198-086387 Rev.B



Weight:
in Air ~24.5kg
in Water ~10kg

Page 1 of 1 (Cd30046)	Subsea Battery Unit - outline dimensions	**N/A**



Weight:
in Air xxkg
in Water xxkg

Page 1 of 1 (CD30047)	Octans module	**830-220139** prelim

INDEX

The next pages presents the index of this manual.

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